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Coconino County Building Code Guidelines

Coconino County Building & Safety Division
Department of Community Development
2500 North Fort Valley Road, Building 1
Flagstaff, AZ 86001

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Building codes revised December 2001 per Ordinance 01-13; handbook reformatted March 2004.

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Administration

Building Permits

Application

Building Permits shall be issued upon submitting a completed application form, upon approval of the submitted plans and specifications, and presentation of an approved sanitary system permit where and when required. In certain areas where water service is not available, plans shall be provided for the installation of a water distribution system. Where property adjoins county maintained roads, a road encroachment permit shall be obtained.

Permit applications shall be accepted at:

Community Development - Building and Safety Division
2500 North Fort Valley Road, Building 1
Flagstaff, Arizona 86001-1287

Open Monday through Friday, between 8:00 am and 5:00pm. Phone (928) 226-2700.

Plan Check Deposit

Applications for new residential building construction work shall be accompanied by a non-refundable plan check deposit of $300.00 for a single family dwelling and $100.00 for additions, alterations and accessory structures; new commercial building construction work shall be accompanied by a non-refundable plan check deposit of $750.00 for new buildings and $500.00 for additions, alterations and accessory structures. If the size of the project does not warrant these amounts a plan check deposit fee will be up to the building official. The plan check deposit is non-refundable.

Applicants will be notified by telephone or mail when plans are approved and ready to be picked up. **The balance of the fee is due when the permit is to be issued.** Make all checks payable to: Coconino County Community Development.

Planning and Zoning

Every application and plans submitted for permits shall be approved by the Planning and Zoning Department for one or more of the following: legality of the property; property identification – Assessor Parcel Number; site plan approval of setbacks; correct zoning for use; flood plains; variances; and administrative adjustments. Other functions of Planning and Zoning: conditional use permit; temporary use permit; land division; zone change; DRO; home occupations; cottage industries; guest homes; bed and breakfast; sign permits; lighting permits and fences. Agricultural uses: animals, size of structure and distances to neighbors' homes.

Present Septic Permit

A. For new construction of residential, new manufactured home installations, commercial projects and accessory buildings with plumbing fixtures bring a copy of the septic permit from the County Environmental Services Department, for proof of the approved septic system. Some areas with community sewer require proof of available sewer such as Pinewood and Tusayan. In Kachina Village, obtain a sewer permit for commercial projects.

B. For additions and alterations to existing structures of habitable space where waste water flow is increased by the addition of bedrooms and plumbing fixtures, submit plans to the Environmental Services Department and bring proof of conformance, an Addition/Remodel Septic Permit, to the Building Department.

C. For additions and alterations of habitable space such as living rooms, recreation rooms, sunrooms, and family rooms where the foot print of the building expands, the Building Department will provide a Septic Care Facts Form for the owner to sign which will be forwarded to the Environmental Services Department as a permanent record of the improvements to the property.

   For garages, storage buildings, porches and decks, the Septic Care Facts Form will apply as well.

D. In all cases, the site plan shall show the location of the septic system (tank, leach field and reserve area) requiring a 10 foot minimum distance to all construction. Contact the Environmental Services Department for review of your system, if there is not 10 feet from the septic system.

E. When Alternate waste water systems are necessary, submit plans to the County Environmental Services Department, and, when approved, submit your waste water permit with the Building Permit Application and plans.

F. When a Building Permit Application is accepted without an approved septic permit, the Building Permit process will be on HOLD and the building permit cannot be issued until the septic permit has been issued. If your Plan Check Log Number has been passed before you submit your approved septic permit, the Building Department will have the plans reviewed and the permit prepared within seven (7) working days from the time you submit the approved septic permit.

   For new construction of residential and commercial structures a copy of the septic permit from the County Health Department and/or State Health Department is needed. Garages, decks, and detached storage buildings are exempt. (Garages and storage buildings with plumbing will require a septic permit.)

For additions and alterations to existing structures - check with the Health Department for review of existing septic system and bring Proof of Conformance to the Building Department.

County Health Department
2500 North Fort Valley Road, Building 1
Flagstaff, Arizona 86001
Phone (928) 226-2768

Encroachment Permit for New Construction

A. An Encroachment permit for a driveway and culvert is required when first time new construction occurs or when a new driveway is added or an existing driveway is relocated. The Encroachment permit application must be submitted when the construction plans are submitted.

B. Applications are available at the Community Development Office or Public Works Department. (Room additions and alterations to existing buildings do not need an encroachment permit).

C. Any subsequent improvement within the County right-of-way, such as landscapes, fences, paved or concrete driveways, pipe headwalls, etc., requires a new encroachment permit. Improvements are subject to review and must comply with current County standards.

D. Grading and Excavation permits are required for any dirt-moving project where depths of cut or fill will exceed 50 cubic yards. Other conditions may also trigger the requirement for a grading and excavation permit such as work in a flood plain – Contact the Public Works Department.

   The **Coconino County Public Works Department** is located at 5600 East Commerce Avenue (Sheep Hill), Flagstaff, Arizona 86004; telephone (928) 526-2735. (To get there take Santa Fe to Railhead, right on Railhead to Dodge, left on Dodge to Commerce, right on Commerce.)

Electrical Service

Contact **Arizona Public Service** for locations, specifications, and information concerning new electric service at 928-773-6414. If service that has already been established and you need information regarding temporary power contact APS at 779-6911 or toll free at 1-800-253-9405.

Commercial Plans

Plans for new construction, additions and alterations for buildings of 3000 square feet or more, housing for more than 20 people, or public works shall be prepared and stamped by an Arizona State registered architect with associated engineers.

Building Codes

Coconino County Building Department uses the following codes: 1997 Uniform Building Code, 1997 Uniform Mechanical Code, 1999 National Electrical Code, and the State Plumbing Code (1994 Uniform Plumbing Code).

Building Permits Issued

No permit shall be issued to any person who proposes to contract any construction or improvement work unless that person requesting the permit is the holder of a valid contractor's license which is issued by the State of Arizona. However, a permit may be issued to any person to do any construction or improvement work provided that person is himself the bona fide owner of the premises. This owner- builder shall act as the general contractor doing the work himself, contracting the work with a contractor licensed by the State of Arizona, or he may hire someone by the hour when all Federal and State Laws governing employment are adhered to.

Exempt Work

The following work shall be exempt from the requirements of the issuance of a permit and the collection of fees.

1. Fences and free standing masonry walls, no more than 6' in height.
2. Retaining walls 4' or less in height from the bottom of the footing to the top of the wall and provided it supports no load of vehicle or structure.
3. Curbs, planters, driveways, and concrete sidewalks.
4. One story accessory structures not used for human occupancy, up to 120 square feet of floor area and detached from a Single Family Dwelling. The building may have a maximum of a two foot overhang. These structures must also comply with setbacks established in the zoning ordinance.

➲ NOTE **These structures requiring plumbing, electrical, or mechanical installations shall be constructed on a permanent foundation and will require a building permit.**

5. 4' x 5' deck with roof cover for entrance into a mobile home, when built onto a mobile home with a valid Mobile Home Installation Permit.
6. Residential television and radio antennas supported on roofs.
7. Repairs which involve only the replacement of component parts of existing work with similar materials for the purpose of maintenance. Repairs exempt from permit requirement shall not include any additions, change of occupancy, change of design or modification in construction, exit facilities or permanent fixtures or equipment. Specifically exempt from permit without limitation are:
    a. Painting and decorating
    b. Installation of floor coverings and drapes
    c. Cabinetry and finished carpentry work
    d. Storm doors and windows, including arcadia doors
    e. Re-siding and trim, provided structural changes are not made

Double Fee

Any person who shall commence work for which a permit is required, without first having obtained a permit shall have a "Stop Work" or a "No Occupancy" posted on the project. Upon subsequently obtaining a permit for such work, there shall be charged an additional fee, the charge shall be double the amount of the normal building permit fee. A special inspection fee shall be charged when on site inspection is required for work covered up.

Permit Time Limitation and Validity

Permits issued under provisions of the code shall be limited in time as follows:

A. Building permits for new construction shall be valid for three (3) years. Inspections shall be required at least every six (6) months. If after the three (3) year period the structure is not complete, a renewal permit shall be obtained for the cost of the original permit excluding plan review, mechanical, plumbing, and electrical fees. The original permit may be renewed a maximum of two (2) times, for a total of nine (9) years. After the end of nine (9) years, the permit becomes null and void and temporary occupancy, electric, and other permitted uses will be revoked. After that time, a new remodeling permit shall be obtained, with a new plan submittal and the plan reviewed according to the current code cycle.

B. Permits for additions, alterations and accessory structures shall be valid for two (2) years and may be renewed a maximum of two (2) times for a total of six (6) years.

C. A one time renewal of a building permit fee shall be allowed for one (1) year at one-half of the original building permit fees as described in Sections A and B of this Amendment.

D. Manufactured Home, Woodstove, Mechanical, Electrical, and Plumbing permits shall be valid for a period of six (6) months. After that time a new permit shall be obtained if the work has not been completed.

E. A temporary electric power permit will be issued in conjunction with approved permits for new construction. The temporary electric permit will stay in affect until the project is complete and final inspection and approval has been given. The temporary electric power status will be revoked and the meter pulled when any conditions of the permit have not been complied with.

Permits issued under provisions of the code shall become null and void if work authorized by a permit is not commenced within 180 days from the date of the issuance of the permit. Before the work can be recommenced a new permit shall be obtained and a fee paid of one half the amount of the original building permit fee.

The building official may in writing revoke a permit when the permit is issued in error or on the basis of incorrect information supplied, or in violation of any ordinance, regulation or any of the provisions of the code.

Building permit ownership is not transferable. Projects that are sold during the course of construction to another owner shall render the permit null and void.

Shell Cabin Permits

Construction projects where a builder contracts the foundation and structural shell only and the owner completes construction of the building, the permit shall be issued listing the owner as the contractor.

Amendments

Amendments to the Uniform Codes for Coconino County will be found in Ordinance 01-13 Adoption of the Uniform Codes.

Building Plans

Filing Plans

Every application for a building permit shall be accompanied by two sets of plans and specifications. One copy of such plans shall be returned to the applicant when plans are approved by the building department. The other identical copy of the plans are retained by the building department and kept on file until ninety (90) days after the date when the final inspection has been made and occupancy approval is given.

Site Plan Review

Along with the building plans, three copies of the site plan shall be submitted to be reviewed by Planning and Zoning and Public Works to establish compliance with the Coconino County Zoning Ordinance and other county requirements. The site plan shall depict property lines and dimensions, easements, location of all structures, driveways and the wastewater system location. Site plan review will occur prior to building plan review (same as plot plan).

Plans and Specifications

Plans and specifications submitted will be drawn on uniform paper, be legible, complete and stapled together in order. Incomplete or unacceptable plans will be returned or held until sufficient plans are resubmitted.

The Building Official may require, when plans are exceptionally complex, have unusual structural components, or for commercial plans (depending on the size and occupant load), that the plans and specifications with calculations be prepared and stamped by a licensed Arizona State Architect and/or an Engineer. The Building Official may further require that plans for new construction indicate existing and finished grade and floor elevations in areas subject to flooding to satisfy requirements of the County Floodplain Ordinance.

Plan Review

The submitted plans are reviewed by the building department for code and structural requirements. Any corrections are redlined onto both sets of plans and the plans are then stamped approved. These approved plans become the documents from which inspections will be conducted and shall remain on the job site at all times.

Previously Submitted Plans

When a plan is approved by our department, future plans for the same house shall have all corrections made when submitted. Also, contractors and individuals who obtain permits at consistent intervals and know our Building Department policies should make their best effort to have all information we request on their plans.

Revisions to Plans

Revisions and changes in design or materials to the plans and specifications shall be submitted by additional drawings, corrected drawings, or addendum letters. Revisions, submitted by contractors, who represent a specific owner, shall be accompanied by a letter from the owner acknowledging the revisions and changes. Revisions and changes shall be submitted prior to the issuance of the permit or prior to the start of the work on those changes. There will be an additional fee charged for plan review on revisions. Work commenced on revisions prior to approval by the building department will result in a "Stop Work" notice being posted at the job site and all work shall cease.

Plan Requirements

A. Plot Plan: Which shows the location of structure(s) to be built in relation to property lines and any other structure(s) that may be on the property and the distance in feet to such property lines and structures. The location of all easements, driveway, and location of culverts must be shown. New work shall be cross-hatched. Also, show location of septic tank, leach field and reserve area with distance to structures, utility connections, lines, and fences. Show drainage from the building site and any drainage that runs through the property.

Plans below shall be scaled drawings, normally, ¼" per foot.

B. Foundation Plan: Top view, two line drawing of structure.

1. Footings, Stem wall and/or pier - locations and dimensions.
2. Foundation and slab – interior footings, fill material.
3. Girders - beams and bearing points, load points from above.
4. Floor framing - joists - direction, size and spacing, blocking, head-outs, hangers.
5. Foundation vents, crawl access, opening and clearance.
6. Exterior decks and porches – piers, deck framing.
7. Basement foundation walls and retaining walls.
8. Underfloor equipment.

C. Floor Plan: Top view, two-line drawing of walls, columns, and architectural features.

1. Complete dimensions – show all floors and basements.
2. Identify all rooms.
3. Door and window locations and sizes - safety glass locations, escape windows for bedrooms.
4. Stairs, halls, areas, lofts, ramps, guardrails, handrails.
5. Exterior decks and porches – landings, steps to grade, guardrails, handrails.
6. Fireplace, gas stove, wood stove locations - Floor and wall protection, clearances.
7. Cabinets, appliance spaces and attic access locations.
8. Plumbing fixture locations.
9. Smoke detector locations - required in all bedrooms, sleeping areas, hallways, each level, vaults.
10. Electrical plan – light fixtures, switches, outlets, built-ins.
11. Furnace and water heater location, any type of heat (specify fuel).
12. Second floor framing - beams, joists - size and spacing, head-outs.
13. Addition plans shall show - adjacent rooms to the new construction.

D. Roof Framing Plan: Top view of framing over supporting structure.

1. Truss or rafter, direction, size and spacing, blocking.
2. Beams/Bearing points and bearing walls.
3. Type of attic ventilation.
4. Engineered Truss specifications.
5. Exterior porch roofs.

E. Elevations: Two dimensional exterior views - front, sides, rear.

1. 2 elevations for additions, garages, cabanas, decks, and accessory structures.
2. 4 elevations SFD and commercial.
3. Show doors, windows, siding veneer, overhangs, roof slope.
4. Show braced exterior wall sections.
5. Show accurate grade line for building height, stepped foundations, and filled areas.
6. Show positive drainage away from buildings.

F. Cross-Sections: Cut away view.

1. Rough construction: foundation, joists, studs, trusses, bracing of structures, anchors, etc.
2. Finish: drywall, siding, sheathing, roofing, etc.
3. Overhangs: soffits, fascia, blocking.
4. Dimensions: Floor to grade, ceiling height, under floor.
5. Stair information: Rise, run, width, head room.
6. Insulation – floors, walls, ceilings.

G. Details: Larger scale required -½", ¾", 1", etc.

1. Footing and stem, mono pour foundation and slab.
2. Piers, pilasters, beam pockets, pylon footings, and anchors.
3. Special framing and/or connectors used.
4. Masonry fireplace plans and details required.
5. Basement foundation, retaining walls, masonry columns.

To Expedite your Plans through Plan Check

1. Specify the kind of lumber and the grade to be used. All lumber shall be graded and stamped.
2. Specify the number of electrical circuits and size of electric service to be installed.
3. Specify if garbage disposal and/or dishwasher to be installed.
4. Specify type of heating, location of appliances.
5. Specify which appliances will be fueled by gas.
6. Be sure each bedroom has a secondary emergency exit.
7. A-frames and log cabins shall have plumbing details prior to permit approval.

➲ **NOTE** **See Log Home Specifications and Requirements, page 32.**

8. Items requiring engineering and the plans or the details stamped by an Arizona Registered Engineer.
   a. Fireplace and chimney columns used as structural supports.
   b. Masonry columns in excess of 12 feet.
   c. Any wall retaining in excess of 8 feet of soil.
   d. Basement foundation walls in excess of 10' in height and or retaining 8' or more of soil.
   e. Fill material for support of any bearing footing.
   f. Soil fills 4' or more where slabs of buildings are built upon.
   g. Engineered fill material shall be designed by an Engineer as to the composition, placement, compaction, and frequency of soils test. Soils tests and reports shall be provided.
   h. Structural log construction, for girders, joists, rafters, posts and beams etc. wall logs excluded with approved stacking and joining methods.
   i. Lintels used in masonry construction which exceed eight feet.
   j. Any suspended concrete slab supporting a live load, and wood or steel joist floors supporting a concrete floor.
   k. Any communications tower.
   l. Any structural steel building shall be designed for snow load, wind speed and seismic zone, check with Coconino County Building Department for requirements.
   m. Any project where the complexity warrants the design by an Engineer as determined by the Building Official.

Inspections

Inspections Required

All construction work for which a permit is required shall be subject to inspections by the Building Official or his inspectors. It is the responsibility of the contractor or owner builder to personally request or call for inspections and call for follow up inspections when violations are found and corrections are required on the work that has been inspected. Requests for inspections shall be made at least 24 hours before the inspection is to be conducted and follow normal procedures of the jurisdiction for specific and outlying areas. Schedules are available at the Building Department.

It is the responsibility of the contractor or owner builder to have the work accessible, exposed, and unlocked when the inspection is conducted. The work shall, for that specific inspection, be ready and complete and no concrete shall be ordered, no work commenced or covered up until the inspection is conducted and approval is given by the Building Department.

Re-Inspections and Additional Fees

All trades are entitled to one inspection and one re-inspection of corrections on the required inspections. Any work not repaired at the time when the re-inspection is conducted will necessitate the charge of a re-inspection fee.

Re-inspection fees will be charged when the work is not ready and complete, the approved plans are not available on the job site or the job site is not properly identified by the posting of the inspection hard card permit at the time a requested inspection is to be conducted. It is the responsibility of the contractor or owner builder to have the project accessible, unlocked, the work exposed and any animal contained on the premises which would prevent the requested inspection from being conducted or a re-inspection fee will be charged.

Work Not Inspected "Stop Work"

Work that has not been inspected and commenced beyond the point of approval shall have a "Stop Work" notice posted and all work shall cease on the project. The contractor or owner builder will make accessible and expose all work necessary to conduct the required inspections at no cost to the Building Official or the jurisdiction. A special inspection fee shall be charged for the investigative work. The fee shall be paid before the "Stop Work" is lifted and before work may commence.

Special Inspections

Inspections for existing structures or structures to be moved into or within Coconino County, complaints, for renovations, for changes of occupancy, for the purpose of determining if structures are in compliance with the code, conducting an inspection on a non-scheduled day, and for an investigative inspection when work has been covered up without inspection and approval. A special inspection may be given when a permit is issued and a fee is paid.

No Occupancy

No home, building, or structure shall be used or occupied until a final inspection and approval has been made. Violations to this section will result in a "No Occupancy" posted on the structure. The building permit will also be voided out and only reactivated by a special inspection fee being paid.

Special Fees

1. Re-inspection fee .....$47.00 per hour with a 1 hour minimum fee.
2. Special inspection .....$47.00 unit fee, plus $47.00 per hour with a 1 hour minimum fee, plus mileage of $0.54 per mile. If the inspection requires report writing, a $47.00 per hour fee shall be charged.
3. Plan revisions and re-redline .....Revised plans shall be reviewed at a rate of $47.00 per hour with a minimum half hour charge of $23.50.
4. Demolition permits .....$35.75 plus plan check fee.
5. Sign permits .....$35.75 plus plan check fee.
6. Electrical service permit .....$50.00 minimum.
7. Manufactured home permit .....$150.00, plus $20 electric service plus $10 propane, if applicable.

Refunds

Upon approval of the cancellation of a permit 80% of the building permit fee, the plumbing, electrical, and mechanical fees associated with the permit is refundable. The refund shall not include the plan review fee.

Refunds for building permits will only be authorized if the request for refund is made within 360 days of the date the permit was issued.

Refunds for manufactured home permits will only be authorized within 90 days of the date the permit was issued.

All other permits that are valid for only 6 months, no refund will be allowed.

Schedule of Inspections

The approved set of plans shall be available on the job site at all times for the inspector or there will be no inspection. The work shall be inspected according to the approved plans.

1. **Footings:** approved before ordering concrete.
    a. Setbacks: property lines shall be marked.
    b. Trenches: Clean, below frost line, step footings as needed, forms installed as needed, soil bearing compaction, rigid sleeves for piping.
    c. Reinforcement: Horizontal installed in place, rebar chairs installed, verticals with bends, tied, proper laps, cold bends, correct spacing, and verticals located at special bearing points.
    d. Uffer: Electrical ground.
    e. Footings: Perimeter, interior piers, exterior piers, fireplace (masonry), retaining wall, mono pour turndowns, etc.
    f. Concrete Placement: mix, cold weather protection.
2. **Stem, Foundation Wall, Piers and Masonry:** approved before ordering grout.
    a. Block: erected complete, mortar and masonry joints.
    b. Poured walls: forms installed and complete.

c. Reinforcement: vertical, horizontal bond beams, proper laps, tied, correct spacing, verticals at bearing points.
d. Anchors and straps.
e. Crawl access and venting.
f. Under floor: joist and girder clearance, debris cleared, foundations backfilled both sides.
g. Girder pockets: bearing plates, straps,½" air space.
h. Basement walls and above ground masonry: waterproofing, drain tile, emergency exits and masonry openings, lintels, cleanouts, reinforcements, masonry walls and columns.
i. Fireplace: reinforcement, clearances, chimney.
j. Retaining walls: according to plans and engineering.
k. Grout placement: grout lifts not to exceed 6 feet.
l. Masonry planters.
m. Rural lots to meet private road standards.

3. **Under Slab:** approved before ordering concrete.
   a. Water piping: sleeved through slab, no splices copper piping sleeved (contact with cinders).
   b. Drain waste and vent piping: air pressure test or 10' water head test required, 2nd floor drain.
   c. Compaction: Under slab electrical, interior bearing footings, under slab ducts, correct fill mechanically compacted, slab and footing reinforcement.

OR

3. **Floor Framing:** approved before floor sheathing.
   a. Correct sill plate.
   b. Floor joist spans: size and spacing, blocking, nailing, and framing methods.
   c. Girder size and span.
   d. Straps and anchors.
   e. Load bearing members.
   f. Proper head-offs of joists: for plumbing and heating, stairwells and other floor openings.
   g. Under floor space clean of debris and foundation: backfilled both sides.
   h. Log homes: base log, log spiking requirements.

   Floor framing inspections will be required when the complexity of the framing warrants. Check with the Building Inspector.

4. **Framing and Roof Sheathing:** House built according to approved plans - size, room dimensions, ceiling heights, passageways, etc.
   a. Wall framing: stud size and spacing, plates, headers, sheathing and bracing.
   b. Second floor framing: joist spans, size and spacing, blocking, beams, headouts, and chases.
   c. Fire blocking: soffits, stairs, walls 10' plus, roofs at vertical walls .
   d. Roof framing: blocking, eaves, venting, bracing, ridge beams.
   e. Floor sheathing: approved flooring, panel rating and nailing, tongue and groove.
   f. Roof Sheathing: Panel rating, nailing, ply clips, or blocking.
   g. Ice dam eave protection: materials on site, roofing materials verified for "Class B" minimum.
   h. Notch and drilled holes: studs, joists, rafters, and beams.
   i. Stair Framing: rise, run, headroom, and width.
   j. Emergency exit windows: rough opening.
   k. Safety glass: locations identified.
   l. Attic access.
   m. Framing anchors and wall bracing: let in braces or sheathing for exterior and interior walls .
   n. 2 x 6 Plumbing walls: other vent chases framed to roof.
   o. Fire wall and fire ceiling framing.
   p. Drywall backing.
   q. Wood to earth separation.
   r. Flashing: vents through roof, wall to roof connections.
   s. Check building height for multi-story buildings: 35' maximum.

5. **Pre Drywall and Rough Inspection:** House built according to approved plans- approved before dry wall covering.

Building

a. Framing complete: See above, ***#4 Framing and Roof Sheathing***.
b. Emergency exit: windows installed.
c. Vapor barrier.
d. Exterior wall siding: proper stud spacing and nailing.
e. Roof covering installed, eave protection for severe climate verified, flashing complete, vent terminations complete.
f. Safety glass locations: windows installed.
g. Under floor inspection: trades workmanship.
h. Identify framing in garage for fire wall/ceiling.
i. Insulation, installation, location and type.

Rough Plumbing

a. Water piping material and installation: air pressure test.
b. Drain waste and vent material and installation: air pressure test or 10' water head test.
c. Nail plate piping protection.
d. Vent terminations: enclosed to roof/pressure relief valve piped outside.
e. Gas piping material and installation: air pressure test, interior piping and yard line, coated pipe under-ground locations, shading two-stage systems, shut-off, union, tracer wire for plastic pipe.
f. Sewer connection: yard line, trench, shading, and cleanouts.
g. Water service: yard line material, trench, shading, back flow preventer, and shutoff.

Rough Electrical

a. Electric installation: approved material and wire method according to approved plans.
b. Small appliance circuits: kitchen, dining, and pantry.
c. Bathroom receptacle circuits.
d. Laundry circuits.
e. GFCI proper locations.
f. Arc-fault circuits for bedrooms.
g. Smoke detectors proper locations.
h. Nail plate wiring protection.
i. Boxes: device ready.
j. Water bond and gas bond installed.
k. Electric service: green tag.

Rough Mechanical

a. Appliance enclosure clearances.
b. Appliances vented to the outside.
c. Combustion air openings.
d. Duct installation.
e. Equipment locations according to approved plans, proper clearances, and manufacturer's listings.

6. **Drywall Nailing:** Approved before tape and texture.
   a. Correct nails and spacing.
   b. Fire resistive walls and ceilings.
   c. Green board tile backing.

7. **Miscellaneous Inspections**
   a. Pre-stucco for lath installation, nailing.
   b. Brick veneer: mortar, ties, air space, and backing.
   c. Masonry planter.
   d. Special inspections.
   e. Temporary electric service: construction purposes.
   f. Foundation waterproofing and drain tile.
   g. Irrigation systems.

8. Final

Building

a. Exterior siding, trim, and wood decks sealed and finished.
b. Balconies, decks and stairs: exterior and interior guardrails, handrails.
c. Exit landings, decks, steps to grade.
d. Yard finished for drainage.
e. Fire wall and door for attached garage and accessories.
f. Interior trim sealed and finished.
g. Drywall textured and painted.
h. Cabinets installed.
i. Safety glass installed.
j. Under floor and attic space for trades workmanship.
k. Elevation certificate for homes in floodplain.

Plumbing

a. Fixtures installed: piping connected, low flush toilets required.
b. Water heater pressure relief valve to outside functioning, expansion tank.
c. Vents properly terminated.
d. Septic systems approved by Health Department and operating.
e. Alternate water system approved and operating.

Electrical

a. Electrical devices installed and trimmed out.
b. Polarity of receptacles.
c. Electric service and sub panels finished and circuits identified.
d. GFCI outlets installed and operating.
e. Arc-fault circuits installed and operating.
f. Smoke detectors installed and operating.

Mechanical

a. Appliances installed: manufacturer's specifications.
b. Vents properly terminated.
c. Ducts and air supply trimmed out.
d. Combustion air ducts and screen complete.
e. Woodstove installation: combustibles protected.

Exterior Site

a. All slash (from site clearing) and scrap building materials shall be removed.
b. All drainage swales complete.
c. No surface water or roof water shall adversely affect adjacent properties.
d. Driveway culvert installed and approved by the Department of Public Works.

Certifications and Notifications

1. **Zoning Certificates:** May be a part of the Building Permit process. (The issuance or approval of zoning use permits, variance permits, temporary use permits and special use permits shall not be construed to be functions of the Division of Building and Safety but shall continue to be processed as otherwise required by law.)

2. **Certificates of Occupancy:** A Certificate of Occupancy shall be issued on request after the approval of the final inspection on any structure used for human occupancy.
   a. New construction – Buildings, additions and remodeling showing completion of work, compliance of work, compliance of all code requirements and approval to occupy.
   b. Change of Occupancy - Showing compliance of existing buildings to code requirements and approval to occupy when change of occupancy occurs. Issued in conjunction with a remodeling permit.

3. **Letter of Compliance:** A letter written by the Building Official concerning new or existing structures, or projects under consideration. They may be associated with remodeling, pre-moving, change of occupancy, individual trade inspection approval, building construction and code recommendations and special inspections.
4. **Inspection Hard Card:** The owners record of inspections to be posted visibly on the job site and to be protected. The building inspector documents with his initials and date each individual inspection, when approved, allowing construction to continue.

> ➲ **NOTE** **May be a letter of noncompliance.**

5. **Correction Notice:** Posted on the job site by a building inspector, stating violations of building procedures with the appropriate code sections noted and construction recommendations to inform the builder what is required to obtain approval on the inspection. When a correction notice is posted work shall continue to first correct violations and then calling for a re-inspection on the corrections of the work.
6. **Stop Work Notice:** Posted on a job site by a building inspector when: A construction project has begun without a permit, design or materials are deviated from the approved plans, when any work is being done contrary to the provisions of the code, or when work has commenced beyond the point of inspections made. All work shall cease on the project until authorized by the building official to proceed with the work.
7. **No Occupancy Notice:** Posted on the job site by a building inspector notifying the occupants of a structure that a final inspection has not been made or a hazard with the structure exists.
8. **Notice:** Posted on the job site conveying a message from the building inspector.
9. **Green Tag:** Approval on specific work. (Example - electric service, gas service)
10. **Red Tag:** Specific work not approved and hazardous conditions.
11. **Yellow Tag:** Temporary power approved for construction purposes only. The electric meter may be pulled and service denied when customers fail to have all required inspections. See Temporary Power (Electric Section) for further requirements.
12. **Temporary Occupancy:** Special permission given by the building inspector to occupy a structure prior to final completion.

Building and Safety Advisory Board

The Building and Safety Advisory Board as described in the ordinance.

Any permit holder, a licensed Arizona State Contractor, a licensed Arizona State Professional Engineer or Architect may request a waiver to any section of the Building Codes, which is to be heard by the Building and Safety Advisory Board. An application and a written letter describing the waiver to the code section shall be submitted to the Building Official, at which time a meeting will be scheduled.

If a waiver is requested on a project under construction due to code violations or any other reason, all work on that project shall cease until the said waiver is heard by the Building and Safety Advisory Board.

Building

Foundations

Soil Bearing and Classification

1. The classification of the soil at each building site shall be determined when required by the Building Official.
2. The Building Official may require that this determination be made by an engineer licensed by the State of Arizona and a report submitted.
3. Fill material which is used in slab floor construction shall be limited to ⅜" or less dirty cinder or "AB"
4. When expansive soils are present, soil fills in excess of 4', adjacent loads encountered or soil retaining required, the building official may require an engineer to provide the design and construction criteria for the soil and the foundation.

Preparation of Building Site

All stumps and roots shall be removed from the soil to a depth of at least 12 inches below the surface of the ground in the area to be occupied by the building.

All wood forms which have been used in placing concrete, if within the ground, shall be removed.

The crawl space and the entire site shall be cleaned of building materials and debris before the building is occupied. Foundation trenches shall be backfilled under the structure and around the exterior before the building is occupied.

Foundation Details

Coconino County Foundation Details are provided on ***pages 64 through 71*** of this book.

Anchorage

1. Sill Plates to Stem Walls:
    a. ½" x 10" Anchor bolts spaced 4'oc into a reinforced grouted masonry cell.
    b. ½" x 15" Anchor bolts spaced 6'oc into an un-reinforced grouted masonry cell.
    c. ½" x 10" Anchor bolts spaced 6'oc into poured concrete stem.
    d. In addition, sill plates on stem walls shall be bolted within 12" from the end of each piece into a grouted reinforced cell or poured concrete.
2. Sill Plates to Slabs:
    a. ½" x 10" Anchor bolts spaced 6'oc into mono pour foundations and slabs.
    b. Interior slab footings for bearing walls (when required) ½" x 10" anchor bolts spaced 6'oc (e.g. house to garage turndown).
    c. In addition, sill plates on slabs shall be bolted within 12" from the end of each piece.
3. Girders to Pier: Use one minimum ⅛" x 1½" x 24" FHA strap with bend embedded 15" minimum into a reinforced cell of a grouted masonry pier. Other approved straps may be used.

4. Ledgers to Masonry or Concrete Walls:½" x 8" Anchor bolts (with 8" walls), spaced 32"oc A #4 horizontal bond beam or #4 vertical reinforcement shall be installed at the anchor bolt location.
5. Post Anchorage:
    a. Piers supporting wood posts shall have an approved post base anchor embedded into the reinforced grouted masonry cells or solid poured concrete. The approved post anchor shall provide for a metal bearing plate for separation between the wood and concrete.
    b. If straps are used for post anchorage, the post shall sit on Redwood, Pressure Treated wood or a metal plate and be attached with two FHA straps.
    c. Posts supporting girders or beams shall have approved post caps, "T" straps or any approved connection to prevent uplift.
    d. Posts supported on wooden decks shall be anchored with an approved base for that purpose.
    e. Porch slabs supporting wood posts shall be installed 6" above grade and 1" above adjacent slab - use 1" stand-off post base. Other areas where water splash may occur such as basements and garages, posts shall be installed with a 1" stand-off post base as well.

Wood Construction

Foundation Sill

1. Approved Material: Construction heart foundation redwood (R.W.) or pressure treated (P.T.) fir. Both shall be stamped by an approved agency.

> ➲ **NOTE** **Pressure treatment to be either chromated zinc chloride or wolmanized salts processes only.**

2. Stem Wall: 2 x 6 minimum R.W. or P.T. sill plates, to carry joist systems, on 8" stem walls.
3. Slab: R.W. or P.T. sill plates for slabs on grade, for exterior and interior walls.
4. Piers: R.W. or P.T. sill blocks shall cover edge to edge of pier and be the same width of girder or beam.
5. Ledgers: Ledgers in contact with masonry or concrete shall be R.W., P.T. wood, or protected from the masonry or concrete by galvanized sheet metal.

> ➲ **NOTE** **Ledgers on masonry in interior areas or when 8' above grade in exterior locations are exempt.**

Lumber Identification

All lumber shall be graded and stamped as per UBC Section 2303 and 2304. Our structural calculations and plan review are based on DF #1 girders and beams, DF #2 or better construction grade for studs, joists and rafters, unless otherwise noted and approved. Pine and any other locally produced lumber shall be graded and stamped or a certificate of inspection from an approved agency is required prior to issuance of a Building Permit.

Girder Bearing

3" minimum bearing for girders supported on masonry or concrete.

Girder Posts

4 x 6 minimum DF #2 or better with approved connections top and bottom to prevent uplift and braced diagonally.

Girder Material

1. Solid Beams: DF #1, and built-up beams of #2, 1100 Fb.
2. Beams and timbers: 6 x 10 and larger DF #1, 1300 Fb.

3. Built Up Girders: nail with 20d @ 24"oc staggered both sides. Four or more shall be bolted with½" diameter at 32"oc staggered.
4. Glue Laminated Beams: DF #1, 2400 Fb.
5. Engineered micro-lams: per manufactured specifications.

Table B-1: Girder Spans - Douglas Fir Beams and Lumber	
For single story (one floor load) 24' maximum width of single family dwelling - Floor Load Only	
4 x 8 Girder	5'0" maximum clear span
4 x 10 Girder	6'6" maximum clear span
4 x 12 Girder	8'0" maximum clear span
4 x 14 or 6 x 10 Girder	10'0" maximum clear span
6 x 12 Girder	12'0" maximum clear span
For two story 24' wide house or single story with house width greater than 24'	
4 x 10 Girder	4'6" maximum clear span
4 x 12 Girder	6'0" maximum clear span
4 x 14 or 6 x 10 Girder	7'3" maximum clear span
6 x 12 Girder	8'6" maximum clear span
6 x 14 Girder	9'4" maximum clear span

➲ **NOTES:** For built-up girders, use these conversions:

1. 3 - 2 x 6 = 4 x 8
2. 3 - 2 x 8 = 4 x 10
3. 3 - 2 x 10 = 4 x 12
4. 3 - 2 x 12 = 4 x 14

Girder sizes, for larger spans or carrying more floor loads and/or roof loads shall be designed to carry all of the loads. All beam sizes will be checked at plan reviewed.

Girder Beam Pocket

1. Adjacent masonry cells shall be grouted solid and reinforced.
2. Girder to bear on R.W., P.T. wood, or steel plate.
3. ½" air space around girder.

Foundation Vents

1. One (1) square foot of venting per 150 square feet of crawl area.
2. Distributed evenly along length of walls and to provide for cross ventilation.
3. Openings screened with corrosion resistant mesh, or approved louvered devices with mesh.
4. Closable type, louvered openings are not allowed when gas fired appliances are located in a crawl space and depend upon combustion air supplied through those foundation vent openings.

Crawl Access Openings

1. 18" x 24" Minimum clear opening with door.
2. Openings to service appliances located in a crawl space shall be 30" x 30" minimum with door and located within 20' of the appliance.

Floor Joist Framing

1. Joist spans: ***See Table FJ-1, page 57*** - residential floor loading is 40 pounds per square foot plus dead loads.
2. Deck joist spans: ***See Table FJ-7, page 57*** - residential exterior deck, porch or balcony floor loading is 60 pounds per square foot plus dead loads.
3. Joists bearing over girder or on hangers:
    a. 1½" Minimum bearing each end.
    b. 3" Lap for opposing joists over girder or partition.
    c. 24" long, 2 x ___ lumber or ½" plywood splice for opposing joists butted in line over girder or partition.
    d. Approved hangers to attach joists to the face of beams or ledgers.
4. Special joists:
    a. Double joists under plumbing walls and parallel exterior bearing walls. Double joists for head outs around stairwells, masonry fireplaces, and any other opening 4' or more.
    b. Head out joists for plumbing and mechanical chase.
5. Blocking:
    a. Blocking shall be 2" thick and full depth of joists.
    b. Joists shall be blocked at ends and each support. Rim joist may be used.
    c. 2 x 12 Joists shall have mid-span blocking or bridging at 8'oc.
    d. For non-bearing interior walls parallel to joists, add blocking at 2'oc between joists for proper wall nailing.
6. Joists supporting bearing walls:
    a. Joists under parallel bearing walls shall be designed as a beam.
    b. Bearing walls perpendicular to joists shall not be offset from the supporting girder by more than the joist depth.
7. Pre-fabricated joists: manufactured truss joists shall be engineered and installed according to manufacturer's specifications.
8. Joist notching and bored holes:
    a. Notches on ends of joists shall not exceed¼ the joist depth.
    b. Notches in the top or bottom of joists shall not exceed 1/6 the joist depth and not be located in the middle third of span.
    c. Holes bored in joists shall not be within 2" of the top or bottom and the diameter of hole shall not exceed one-third the depth of joist.
    d. Notches in beams and girders: same as a. and b. above. (Do not notch the tension side of beams.)

Flooring

1. Sub-floor:
    a. APA rated plywood sheathing or rated OSB sheathing shall be used per panel identification.
    b. 4' x 8' x ⅝" panel on supports 16"oc.
    c. 4' x 8' x ¾" panel on supports 24"oc.
    d. 1' x 6' through 1' x 12' nominal board sheathing on supports 24"oc.
2. Underlayment:
    a. Underlayment shall be graded and stamped and approved as a finish floor.
    b. ¼" Minimum underlayment is required over a sheathing sub-floor.
3. Combination sub-floor underlayment:
    a. A.P.A. rated plywood sturdi-floor or rated OSB sturdi-floor shall be used per panel identification. Acceptable floor for carpet with padding.
    b. Sturdi-floor shall be tongue and grooved or edge blocked.
    c. Plywood sturdi-floor shall have cross buck layer filled or underlayment applied over for vinyl floor finish.
    d. 4' x 8' x ⅝" Panel on supports 16"oc maximum.
    e. 4' x 8' x ¾" Panel on supports 24"oc maximum.

Table B-3: 2 x 6 Tongue and Groove Floor Decking		
40 Pound live load (residential floor load) with a maximum deflection of 1/360		
Span	**Minimum E6 Value**	**Lumber Species**
3' to 4' maximum	1.0	Pine
4' to 6' maximum	1.3	Spruce, Select Pine
5' maximum	1.6	D.F.

Wood to Earth and Concrete Separation

Wood shall maintain these clearances to earth or be R.W. or P.T. wood:

1. 6" - Wood on slabs or stems to earth.
2. 6" - Siding to earth.
3. 6" - Girders and joists for exterior decks to earth.
4. 12" - Girders, in under floor spaces, to earth.
5. 18" - Joists, in under floor spaces, to earth.
6. 8" - Posts on individual piers to earth.
7. 6" - Posts on pedestals.
8. 1" - Posts shall be 1" above concrete slabs in garages, porch slabs, basements, and areas subject to water splash or standing water.
9. 2" – Wooden stair stringers to earth; install on concrete pad, R.W. or P.T. wood.
10. Wooden posts shall be separated from concrete by R.W., P.T. wood or metal plate, in all cases.
11. Foundation and deck ledgers shall be R.W., P.T. wood or have galvanized sheet metal between the wood and the masonry or concrete.

Wall Framing

1. Maximum height of dwellings:
    a. Dwellings are limited to three stories.
    b. Dwellings are limited to 35' in height.
    c. Wood stud bearing walls shall not support more than two floors and a roof.
2. Framing details:
    a. Studs shall be placed with wide dimension perpendicular to the length of the wall.
    b. Corners shall be framed with a minimum of three studs.
    c. Stud walls shall be framed with a bottom plate and a double top plate. Non-bearing wall: single top plate.
    d. Double top plates shall provide overlapping at corners, as well as single top plates. The double top plate shall lap over splices each side or corners by 48" minimum.
    e. Breaks in bottom and top plates shall be joined by ⅛" x 1½" x 12" or longer metal strap with 2 - 16d nails each end.
3. Bracing for stud walls:
    a. Any exterior wall and main interior cross walls shall be braced at each end and every 25'oc (methods below).
    b. Let in bracing: 1 x 4, for one story and the top floors of two and three story buildings.
    c. Let in bracing: 1 x 6, for the first story of a two story and the second story of a three story building.
    d. Approved flat strap metal bracing maybe used in place of 1 x 4 let in bracing when installed in an "X" pattern (2 braces) at each location.
    e. When windows, doors or obstructions are within 8' of wall corners and center areas such that let in bracing cannot be used, bracing shall be by sheathed panels with a minimum of 25% coverage of the entire wall length.
    f. Two story buildings the first story shall have a minimum of 25% coverage of the entire wall length.
    g. Three story buildings, the second story shall have a minimum of 25% coverage of the entire wall length and the first story shall have a minimum of 40% solid sheathing of the entire wall length.

h. ⅜" plywood CDX, 4' x 8' panel sheathing, sheer nailed.
i. ⅝" 303-T-111 or OSB 4' x 8' panel siding nailed to specs.
j. Hard board 4 x 8 panel siding with bracing panels at each end and every 25'oc, sheer nailed 4"oc at edges and 8"oc in field.
k. Building walls with garage doors having wall spaces next to the garage door of less than 8' the wall shall be braced by solid panel sheathing.

4. Foundation cripple walls:
   a. 14" Minimum stud length: size as for studs and braced as for first story walls, ***use Table B-4***. Spaces less than 14" shall be solid blocked.
   b. Walls exceeding 4' in height, studs shall be sized for an additional story.

Table B-4: Size, Height, and Spacing of Wood Studs

	Bearing Walls				Nonbearing Walls	
Stud size (inches)	Stud height (feet) unsupported	Spacing (inches)			Stud height (feet) unsupported	Spacing (inches)
		Roof load	Floor and roof load	Two floors and roof load		
2 X 3	--	--	--	--	10	16
2 X 4	10	24	16	--	14	24
3 x 4	10	24	24	16	14	24
2 x 6	10	24	24	16	20	24

5. Headers above windows and doors:
   a. Headers shall be solid 3½" x ___ or two pieces 1½" x ___ with½" plywood spacers, placed on edge. Furring required for 2 x 6 studs
   b. Headers shall bear on 1½" stud trimmers
   c. Headers shall be nailed to adjoining king stud
   d. Headers longer than 12' shall bear on two 1½" stud trimmers
   e. Header spans, ***use Table B-5***.

Table B-5: Header Spans 40lb Snow Load and 15lb Dead Load – Uniform Load

Bearing	Interior Walls				Exterior Walls		
Douglas Fir headers or 2-2" solid lumber	One load 12' wide tributary area	One load 20' wide tributary area	Two loads 20' wide tributary area	Three loads 20' wide tributary area	16' wide and 2' overhang		
					Roof load	Floor and roof load	Two floors and roof load
4 X 4	4'	3'	--	--	2'	--	--
4 X 6	6'	4'6"	3′	--	3'6"	2'6"	2'
4 X 8	8'	6'	4'6"	3'6"	4'6"	3'	2'6"
4 X 10	10'	8'	5'6"	4'6"	6′	4'	3'6"
4 X 12	12'	9'6"	7'	5′6"	7'	5'	4'

Garage Headers D.F.	8' Span	10' Span	12' Span	14' Span	16' Span	18' Span
Roof 14' wide maximum with 2' overhang	3 - 2 x 12 DF	6 x 12 DF	3⅛ x 13.5 GLB or 5⅛ x 10.5 GLB	3⅛ x 15 GLB or 5⅛ x 12 GLB	5⅛ x 13.5 GLB	5⅛ x 15 GLB
Roof 18' wide maximum with 2' overhang	6 x 12 DF	3⅛ x 12 GLB or 5⅛ X 10.5	3⅛ X 15 GLB or 5⅛ X 12 GLB	5⅛ X 13.5	5⅛ X 15	5⅛ x 16.5 or 6¾ x 15
Roof and flood load 18' wide with 2' overhang	3⅛ x 15 or 5⅛ x 12	5⅛ x 13.5	5⅛ x 16.5	6¾ x 16.5	6¾ x 18	6¾ x 19.5 or 8¾ x 18

6. Fire blocking required:
    a. At stud spaces exceeding 10' in height
    b. At soffits and drop ceilings
    c. In stud spaces adjoining stairs
    d. Concealed spaces made by floors or roofs intersecting vertical walls
    e. Chimney chases at 10’ vertical and communication with attics
7. Backing for interior finish: All intersecting walls and walls intersecting with ceilings shall be provided with solid 2" nominal lumber for attachment of interior finish.
8. Plumbing walls and mechanical chases:
    a. Plumbing walls and mechanical chases shall be 2 x 6 studs or larger
    b. Notching in framing members shall be within code limitations
    c. Vents and ducts shall be concealed until the point of termination
9. Notching and bored holes in studs:
    a. Notching studs in exterior and bearing walls shall not exceed 25% of the width and shall not exceed 40% in non-bearing walls
    b. Bored holes in studs in bearing walls shall not exceed 40% of the width and shall not exceed 60% in non-bearing walls. 60% may be bored in any stud provided the stud is doubled and not more than two successive studs are doubled
    c. Bored holes shall not be nearer than ⅝" to the edge of a stud

Structural Anchorage and Bracing

Positive structural anchorage shall be assured from roof to walls, walls to floors, and floors to the foundation, to prevent up-lift and sliding forces by approved anchors and straps. When exterior finish materials of horizontal siding, panel siding which is spliced at plate lines, stucco, brick veneer, or any other exterior finish material which does not provide for positive structural anchorage is used, approved anchors and straps shall be installed to make a positive connection from the sill foundation plates up to the roof structure.

1. All connections at floors in multi level structures shall be strapped.
2. Straps, ties and anchors shall be installed at 4' OC minimum for these purposes.

Drywall shall not be allowed as a method to structurally brace a building. Use only approved methods as specified in the Wall Framing Section, Number 3, Bracing for Stud Walls. Drywall shall not be allowed as a material to hold the bottom edge of 2 x 12 joists or rafters in line for their entire length in lieu of mid-span blocking or bridging. Nominal lumber ceiling finish may be used for this purpose.

Roof Construction

Framing

1. Rafter spans, ***see Rafter Tables, pages 59 through 62***. Rafter span loading will be the required snow load plus dead loads.
2. Ceiling joist spans, ***see Table CJ-4, page 58***.

3. Ridge, hip or valley members, supporting rafters sloped less than 3:12, shall be designed as a beam.
4. Ridge beams:
    a. Ridge beams supporting roofs with open or vaulted ceilings (no wall ties) shall be designed to carry the imposed dead and live loads.
    b. Ridge and roof beam design values:
        i. Glue laminated beams - 2400 Fb.
        ii. Douglas fir solid or built-up - 1100 Fb.
        iii. Douglas fir #1 - 1300 Fb for beams and timbers 6 x 10 and larger.
        iv. Pine - not allowed unless graded and stamped and a design value given.
    c. Ridge beams shall have 3" minimum bearing on solid wood posts carried down to approved foundation.
    d. Ridge beams shall be anchored with approved ties and methods, to supporting posts.
    e. A ridge strap over the top of the ridge, connecting opposing rafters shall be installed at 4'oc.
5. Conventional roof framing:
    a. Ridge boards shall be one size larger in depth than the rafters they support.
    b. Roof framing rafters with ceiling joists, wall ties, collar ties, or other methods shall provide a rigid triangulation of forces so the ridge does not sag and the walls do not spread. Wall ties or collar ties shall be installed at 4'oc and located greater than one-half the distance down from the ridge board to the top of the wall.
    c. Rafters shall be framed directly opposite each other.
    d. 2 x 6 purlins or purlins of a size no less than the rafters they support, may be used to carry roof loads and reduce rafter spans provided they are supported down to bearing walls by 2 x 4 struts at 4'oc, not less than 45 degrees from horizontal.
    e. Hip and valley boards shall be 2" nominal material one size larger in depth than the rafters they support.
    f. A ridge tie, connecting opposing rafters below the ridge board shall be installed at 4'oc.
6. Pre-fabricated roof trusses:
    a. Trusses are normally manufactured. Trusses in excess of 20' shall be engineered.
    b. Trusses up to 20' may be home made with an approved design.
7. Roof bracing and blocking:
    a. Roofs shall be braced on each end and every 25'.
    b. Ridge beams over vaulted ceilings shall be tied into interior walls or posts which are adequately braced.
    c. Rafters and trusses shall be blocked at ends and bearing points.
    d. 2 x 12 rafters shall have mid-span blocking or bridging at 8'oc.
8. Porch posts: minimum 4 x 4 posts solid with maximum spacing 6' between posts.
9. Porch beams: Same requirements as bearing wall headers.

➲ NOTE **May be 2" nominal, laminated lumber with½"plywood, glued and nailed as an alternate method.**

10. Roof anchorage:
    a. Hurricane ties, approved metal straps are required between rafters, trusses, and exposed rafter beams at 4'oc maximum to the wall.
    b. Porch beams and posts and other roof beams shall be tied with approved connectors.
11. Roof structures: Stamped engineering calculations and design data may be required for any unusual design or long span roof systems at the discretion of the Building Official, prior to issuance of a permit.
12. Drip Edge and Fascia: The exposed edge of plywood sheathing at the eaves shall be protected by a drip edge of metal flashing or a 1 x ___ wood strip. Conventional construction methods normally provide a kiln dried lumber 2 x 6 nominal or larger fascia board with drip edge, as the finish treatment for the eaves.
13. Soffit finish: Soffit plywood or other covering shall be for exterior use.
14. Eaves along gable ends shall be supported by 2 X 4's minimum outlookers at 4'oc maximum, located under sheathing edges.

15. Roof sheathing:
    a. A.P.A. rated plywood sheathing or OSB sheathing shall be used as per panel identification
    b. 4' x 8' x½" panel on supports 24"oc requires ply clips or edges blocked.

> **➲ NOTE** **In low live load areas (Sedona and Page) and when the pitch is in excess of 5:12 or thicker sheathing is used, ply clips or edge blocking is not required.**

    c. 2 x 6 T & G decking spans, ***use Table B-6***.
    d. 4' x 8" x ⅝" minimum sheathing - 40/20 rated panel for tile roofs.
    e. 2 x 4 spaced sheathing at 24"oc for corrugated metal roofs.

Table B-6: 2 x 6 Tongue and Groove Roof Decking

Roof slope 4:12 and greater – 30lb live load (snow load) with a maximum deflection of 1/240		
Span	**Minimum E6 Value**	**Lumber Species**
4' to 6'	.862	Pine, Spruce
6' to 7'	1.370	D.F., Select Dex Spruce
7' to 8'	2.040	S
Roof slope less than 4:12 – 40lb live load (snow load) with a maximum deflection of 1/240		
Span	**Minimum E6 Value**	**Lumber Species**
4' to 5½'	.884	Pine
5½ to 6½'	1.190	Select Spruce, D.F.
6½' to 7'	1.820	Select D.F.

Roof Flashing

Attach roof flashing and jacks before roof covering is applied. Prefabricated galvanized metal roof jacks properly sized for piping penetration, and other metal flashing as needed.

Roof Covering

1. Roof covering for new construction and re-roof applications shall use materials for a "Class B" fire rated assembly minimum.
2. Roofing felt: all roofs shall be covered with 15lb felt before the roof covering is applied.
3. Roofing to be installed according to manufacturer and UBC specifications.
4. Roof covering requirements for asphalt shingles and wood shingles and shakes, installations, slope minimum or maximum and nailing, ***see Table B-8, page 22***.
5. Wood shake and shingle roofs: use #1 grade shakes and shingles only. Weather exposure, ***see Table B-8***.

> **➲ NOTE** **Wood shingles and shakes shall be factory treated per U. L. Specification, 790 for "Class B" minimum which requires no re-treatment for the life of the roof, to maintain the fire resistive integrity and rating.**

6. Severe Climate: All areas in Coconino County (except Page, Tuba City, Winslow, Ash Fork) roof eaves shall be protected as follows: Asphalt shingles for roof pitch 4:12 and over – 40lb coated roofing, with laps cemented together, installed on the eave and beyond the interior wall line 12". Asphalt shingles for roof pitch 2:12 to less than 4:12 - the two layers of 15lb felt; laps shall be cemented together, installed on the eave and beyond the interior wall line 24". Wood shingles and shakes - Two additional layers of 15lb felt applied shingle fashion, solidly cemented together, installed on the eave and beyond the interior wall line 36".
7. For installations of tile, built up roofs and other roof coverings, ***see Section 1507 in the Uniform Building Code***.

Table B-8: Roof Coverings		
	Asphalt Shingles	
Roof Slope	2:12 to less than 4:12 (Not permitted below 2:12)	4:12 and over
Deck Requirement	Asphalt shingles shall be fastened to solidly sheathed roofs	
Underlayment 1	Two layers 15lb felt applied shingle fashion. Start with 18" side sheet then 36" wide sheet over. Shingles self sealing type.	One layer non-perforated 15lb felt lapped 2" horizontally and 4" vertically
Attachment Type of Fasteners	Corrosion-resistant nails, minimum 12 gauge ⅜" head, or approved corrosion resistant staples, minimum 16 gauge 15/16 crown width. Fasteners shall be long enough to penetrate into the sheathing ¾" or through the sheathing, whichever is less.	
Number of Fasteners	2 per 9" to 18" strip; 4 per 36" to 40" strip	
	Wood Shingles	**Wood Shakes**
Roof Slope	Not permitted below 3:12 (See Shingle Exposure)	Not permitted below 4:12 (See Shake Exposure)
Deck Requirement	Wood shingles and shakes shall be fastened to solidly sheathed roofs	
Underlayment 1	No requirement	One 18" wide interlayment 30lb felt between each course, not felt to be exposed below the shake butts.
Attachment Type of Fasteners	Corrosion-resistant nails 14½ GA., 7/32" heads	Corrosion-resistant nails #13 GA., 7/32" heads
	Fasteners shall be long enough to penetrate into the sheathing ¾" or through the sheathing, whichever is less.	
Number of Fasteners	2 per shingle	2 per shake
Maximum Weather Exposure (Slope/Length)	3" to less than 4" in 12"	4" in 12" and steeper
Wood Shingles #1 Grade Only		
16"	3¾	5
18"	4¼	5½
24"	5¾	7½
Wood Shakes #1 Grade Only		
18"	7½	7½
24"	10	10

Roof Ventilation

1. Attics shall be ventilated by gable vents or soffit and ridge type vents.
2. Recommend that rafter spaces in vaulted ceilings be vented with soffit and ridge type vent.
3. Area of vents:
    a. 1/150 for gable vents.
    b. 1/300 for low and high vents.
4. Vent openings shall be covered with corrosion resistant mesh.

Snow Loads

Snow loads for roof design shall be as stated for the following areas:

A. 40 pounds per square foot:
    1. Areas surrounding Flagstaff
    2. Hart Prairie
    3. Valle Junction
    4. Tusayan
    5. Parks and Bellemont
    6. Areas surrounding Williams
    7. Clear Creek Pines
    8. Starlight Pines
    9. Happy Jack
    10. Forest Lakes
    11. Mormon Lake
    12. Kachina Village
    13. Mountainaire
    14. Pinewood
    15. Jacob Lake

B. 30 pounds per square foot:
    1. Cameron
    2. Tuba City
    3. Areas between Twin Arrows and Winslow
    4. Oak Creek Canyon
    5. Areas surrounding Ash Fork and Seligman
    6. Areas surrounding Fredonia
    7. Alpine Ranchos and Leupp

C. 20 pounds per square foot:
    1. Greenehaven
    2. Marble Canyon

Wall Finishes

Weather Protection

1. All weather exposed surfaces shall have a weather resistive barrier to protect the interior wall coverings.
2. 15lb felt, or a "Grade D" building paper, shall be applied over studs or sheathing of exterior walls. Water-repellant rated panel sheathing does not require a barrier.
3. Approved thermal panel barriers may be used.
4. A.P.A. 303 T-111 siding does not require a barrier.
5. Window and door openings: Exterior wall openings shall be flashed, trimmed out, caulked and approved thresholds installed to make them weather tight.
6. Metal Flashing: galvanized metal flashing shall be used to protect any penetration through a roof and where roofs intersect with vertical walls.
7. Weather exposed wood, unless R.W. or P.T. wood shall be sealed and finished (two coats minimum) with approved coatings.
8. Damp proofing basement walls:
    a. Basement walls shall be damp proofed with approved methods and materials.
    b. Perforated drain tile shall be installed at the exterior base of the wall with a gravel fill to divert underground water away from the building or to an approved sump.

Exterior Siding, Veneer, and Stucco

1. Types of siding shall be installed according to manufacturer's specification and be for exterior use. For 303 - T-111 siding, ***use Table B-7***.

Table B-7: Plywood Panel Siding - A.P.A. 303 Siding

Minimum thickness	Minimum number of plies	Stud spacing direct over studs
⅜"[1]	3	16"[2]
½"	4	24"

➲ **NOTES:** 1. Thickness of grooved panels measured at bottom of grooves; 2. May be 24" if applied over ½" plywood sheathing.

2. Siding shall be tongue and groove, ship lap or overlapping types, to prevent water infiltration. Splices between siding boards and panels which do not prevent water infiltration shall be covered with a batten board and caulked or protected by metal "Z-type" flashing.
3. 1 x ___ Vertical board siding shall be nailed to horizontal blocking placed in between studs spaced 24"oc.
4. All siding shall be installed over the correct stud spacing.
5. Weather resistive barrier: ***See Weather Protection, page 23***.
6. Stone or masonry anchored veneer:
    a. Supported on a permanent foundation.
    b. Studs spaced 16"oc maximum.
    c. Install over solid sheathing or wire backing with a weather-resistive barrier.
    d. 1" Air space between veneer and backing.
    e. Ties shall be corrosion resistant and support no more than 2 square feet.
    f. Veneer: 5" maximum thickness.
    g. 30' Maximum height.
7. Adhered veneer: Supported by an approved bonding material over an approved backing.
8. Stucco:
    a. Installed over studs spaced 16"oc.
    b. Lath applied over weather resistive barrier and #18 wire backing. Lath shall be furred out¼".
    c. Three coats, ⅞" minimum application.
    d. Use two layers grade D paper when installed over wood sheathing.
    e. Weep screed - 3-½" high flange, corrosion resistant, self-draining, and located below the sill line 4" above grade. The lath and paper shall cover the flange of the screed.
    f. ⅜" approved single coat type applied over½" foam board, according to manufacturer's specifications.

Insulation

1. Stud walls: R-11 minimum.
2. Floors in crawl space: R-11 minimum.
3. Masonry walls: R-8 minimum.
4. Ceilings: R-19 minimum.
5. Vaulted ceilings: R-9 minimum.

Drywall and Interior Finish

1. Drywall nailing: ***Use Table B-9***.

Table B-9: Drywall Nailing Schedule		
Nails for ½" Drywall		
13lb GA., 1⅜" long, 19/64" head	.098" diameter, 1¼" long, annular ringed	5d, cooler nails, .086" diameter, 1⅝" long, 15/64" head
Nails for ⅝" Drywall		
13lb GA., 1⅝" long, 19/64" head	.098" diameter, 1⅜" long, annular ringed	6d cooler nails, .086" diameter, 1⅞" long 15/64" head
Drywall screws: Screws shall conform to UBC Standard #47-5 for drill screws. Screws shall penetrate a minimum of ⅝" into framing members.		
Nail Spacing: Nails shall be spaced a maximum of 7"oc for both the edges and in the field. The field nails may be double nailed between 2" to 2½" apart and the pairs shall be spaced 12"oc maximum.[1]		
Screw Spacing: Screws shall be spaced no greater than 12"oc.[2]		
➲ **NOTES:** 1. Drywall applied to walls only, the nails may be spaced 8"oc; 2. Drywall applied to walls only with studs spaced 16"oc maximum; screws may be spaced 16"oc maximum.		

2. Drywall joints and nails shall be finished and walls textured for final.
3. Fire resistive drywall: ***See Fire Resistive Occupancy Separations in Dwellings, page 29.***
4. Wood paneling:
   a. Softwood plywood paneling:¼" thick on supports spaced 16"oc, ⅜" thick on supports spaced 24"oc (nail with casing 4d for¼", 6d for ⅜" at 6" on edge and 12" in the field).
   b. Pine shiplap vertical paneling shall be nailed to horizontal blocking placed in between studs spaced 24"oc with 2-6d.
5. Water resistant greenboard drywall:
   a. To be used under ceramic tile in tub and shower enclosures.
   b. Not to be used on ceilings and where unprotected.

➲ **NOTE** **May be used on ceilings where ceiling supports are 12"oc maximum.**

Table B-10: Nailing Schedule	
Joist to sill, girder or wall - toe nail	3 - 8d
2 X 6 T&G Decking - face nail	2 - 16d
Plate to joist system - face nail	16d at 16"oc
Plates to studs - end nail	2 - 16d
Double stud and trimmers - face nail	16d at 24"oc
Double top plate - face nail	16d, 2 at ends and 16"oc
Top plate laps - face nail	2 - 16d
Header, 2 pieces - face nail	16d at 16"oc along each edge
Header to king stud - face nail of beam height	16d 1 per inch
Joist laps at bearing - face nail	3 - 16d
Rafter to plate - toe nail	3 - 8d
Ceiling joists to parallel rafters - face nail	3 - 16d
Ceiling joist to plate - toe nail	3 - 8d
1 x 4 let-in brace - face nail to each stud and plate	2 - 8d
1 x 6 let-in brace - face nail to each stud and plate	3 - 8d
Built up corners and corner channels - face nail both sides	16d at 24"oc
Built up beams - face nail staggered both sides	20d at 24"oc and 2-20d at ends and splices
Built up beams - 4 or more thru bolts 32"oc staggered	½" bolts
Horizontal wood lap or T&G siding - face nail 1 x 4 thru 1 x 6	1 - 8d[1]
Horizontal wood lap or T&G siding - face nail 1 x 8 and larger	2 - 8d[1]
Plywood and OSB floor sheathing - ½"	6d at 6" on edges, 12" in field[4]
Plywood and OSB floor sheathing and sturdi flooring - _" & ¾"	8d at 6" on edges, 10" in field[3]
Plywood and OSB wall and roof sheathing - ½"	6d at 6" on edges, 12" in field[4]
Plywood and OSB wall and roof sheathing - _" & ¾"	8d at 6" on edges, 12" in field[4]
Plywood and hardboard panel siding - ½" or less	6d at 6" on edges, 12" in field[1,2]
Plywood and hardboard panel siding - _"	8d at 6" on edges, 12" in field[1,2]
➲ **NOTES:** 1. Corrosion-resistant siding or casing nails; 2. Hardboard siding - Nail bracing panels, ends and 25"oc, at 4" on edges and 8" in field; 3. Sturdi flooring -deformed shank nails only; 4. Box nails or corrosion resistant staples -7/16" crown, 1⅛" long for ½" and 1½" long for ⅝".	

Residential Requirements

Natural Light and Ventilation – Habitable Areas

1. 1/10 the floor area, 10 square feet minimum - natural lighting.
2. 1/20 the floor area, 5 square feet minimum - natural ventilation.
3. Option for natural ventilation: a mechanical ventilation system capable of providing two air changes per hour with 15 CFM per occupant taken from the outside.
4. Adjoining room: any room may be considered as a portion of an adjoining room when one-half of the area of the common wall is open and unobstructed and provides an opening of not less than 1/10 of the floor area of the interior room or 25 square feet, whichever is greater.
5. A room addition added where a window is located and its removal diminishes the required light and ventilation for the existing room, the existing window shall be relocated to an exterior wall to provide the required light and ventilation for the existing room. Emergency exit windows in bedrooms where required shall be relocated.
6. Bathrooms shall have a window, the openable portion 1.5 square feet minimum or an exhaust fan vented to the outside, capable of five air changes per hour. Make up air shall be provided. Exhaust fans shall discharge to the outside, 3 feet away from any building opening.
7. Basements shall meet necessary light and ventilation requirements.

Room Dimensions

1. Ceiling heights:
    a. 7'6" minimum in dwellings.
    b. 7'0" furred down areas in dwellings, not to exceed one-third the area of any room.
    c. 7'0" minimum in basements, garages and accessory buildings (finished floor to bottom of finished ceiling, beam, pipe or duct).
    d. 7'0" minimum kitchens, bathrooms and halls.
    e. 7'0" minimum to exposed beams spaced 4'oc minimum or more.
    f. Rooms with sloped ceilings: 7'6" minimum height in one-half of the allowed area which is measured between the 5'0" vertical dimension of the room.
    g. 6'6" minimum clearance for porch headers; 6'8" when exiting to steps under porch headers.
2. Floor areas and widths:
    a. 120 square feet minimum for at least one habitable room in a dwelling.
    b. 70 square feet minimum for any habitable room other than a kitchen or bathroom.
    c. 7'0" minimum width for any habitable room other than a kitchen or bathroom.
    d. 3'0" minimum hallways and any passageway.

Egress from Dwellings

1. One (1) required 3'0" x 6'8" swing type exit door to the outside.
2. Any floor at grade shall have a 3'0" x 6'8" exit door to the outside, swinging type.
3. Required exit doors shall be provided with a 3 x 3 landing minimum and steps to grade or provided with a deck and steps to grade. The door shall not swing over the steps or deck; 8" maximum step down to deck.
4. Emergency exit windows in bedrooms: Each bedroom or any room that could be used as a sleeping room shall have one (1) emergency exit window to the outside that meets these requirements:
    a. 5.7 square feet minimum clear openable area.
    b. 20" width and 24" height minimum dimensions within the openable area 44" maximum finished sill height.

➲ NOTE **Do not install emergency exit windows until all requirements and dimensions are first verified.**

5. There shall be one window that meets emergency exit requirements in each area of a basement that could later be turned into a sleeping room with a minimum of two (2). Emergency escape windows in basement shall be provided with window wells. The window wells shall meet the following requirements:
    a. Allow the window to be fully opened.
    b. Provide a minimum accessible clear opening of 9 square feet with a minimum dimension of 3 feet.
    c. Window wells deeper than 44" shall be provided with ladder which shall not encroach into the wells clear space by more than 6" and will allow the window to fully open.
    d. Window wells deeper than 30" shall have guard rails or grates to prevent accidental falling.
6. Garages shall not have any doors or windows opening into a bedroom, sleeping room, or bathroom.
7. Two exits are required from a third story when the area exceeds 500 square feet.
8. Locking devices: Exit doors for a single family dwelling may be equipped with a night latch, security chain, or dead bolt provided they are openable from the inside without the use of a key or special tool.
9. Exterior doors other than required exits shall have a width not less than 2' 8" including the common door between the house and garage. A 5'0" sliding glass door is an exception.

Guardrails and Handrails

1. Guardrails shall be provided on any deck or interior balcony when 30" or more above adjacent grade or floor below and be 36" in height minimum with spaces less than 4" between intermediate rails. (Spaces sized so a 4" sphere cannot pass through.)
2. Handrails shall be provided on one side of stairs 34" to 38" above the nose of the tread.
3. Handrails are required on stairs with four (4) or more risers.
4. Handrails may project a maximum of 3½" into the stairway width. The hand grip portion shall not be less than 1¼" to 2" maximum with a space of not less than 1½" between the wall and the rail. The handgrip portion shall be smooth with no sharp corners.
5. Guardrails shall be provided on open sides of stairways when serving decks or balconies 30" or more above grade or floor and be the height allowed for handrails with spaces less than 4" between intermediate rails. (Spaces sized so a 4" sphere cannot pass through.) The triangular openings formed by the riser, tread and the bottom element of a guardrail, may be sized so a 6" sphere cannot pass through, likewise, the open space of stairs where no riser board is installed, may be the same.

Stairways

1. 36" wide.
2. 8" rise maximum 9" tread minimum.
3. 6'8" minimum headroom.
4. 3' x 3' minimum landing for stairs and at doors.
5. One diagonal step allowed on a landing within a stair run.
6. Winder type stairs and steps shall be 6" wide minimum at the narrowest point and 9" wide minimum, 12" away.
7. Spiral stairs:
    a. May serve areas limited to 400 square feet.
    b. 26" clear width between supporting column and inner edge of handrail.
    c. 9½" maximum rise and a 7½" tread 12" away from the narrowest point.
    d. 6'6" Minimum head room.
8. Other stairs allowed serving areas limited to 400 square feet:
    a. Approved alternating tread-type stairs.
    b. 30" Wide stairs with rise and treads approved for dwellings.
9. Doors at stairs: Doors may be located at the top of stairs provided the doors do not swing over the stairs, interior stairs only. Landings are required at exterior doors.

Safety Glass in Hazardous Locations

Glass in the following locations shall be safety glass:

1. Glass in exit doors, fixed panels, and sliding panels of sliding glass doors and storm doors.
2. Glass within a 24" arc of a door in the closed position and within 60" above the floor.
3. Glass panels meeting the following: Greater than 9 square feet in area, it's bottom edge is within 18" of the floor, its top edge is greater than 36" above the floor and one or more walking surface are within 36" horizontal of this glass.

> **➲ NOTE** **Safety glass in #3 above is not required if a protective bar is installed on accessible sides of the glass, between 34" to 38" above the floor, sized a minimum of 1½" and is capable of withstanding a 50 pound per lineal foot force without the bar contacting the glass.**

4. Glass in walls enclosing stairway landings or within five feet of the bottom and top of stairways where the bottom edge is less than 60" above a walking surface.
5. Glazing in doors, enclosure panels, and building wall enclosures where the bottom edge of the glass is within 60" above the drain inlet of hot tubs, whirlpools, saunas, steam rooms, bathtubs, and showers.

Hinged Shower Doors

Hinged shower doors shall open outward.

Smoke Detectors

1. Smoke detectors shall receive their primary power from the building wiring (110 volt current) and be equipped with a battery back-up. The smoke detector shall emit a signal when the battery is low. Smoke detectors may be solely battery operated when installed in existing buildings or when there is no commercial source of power available.
2. Smoke detectors are required for new dwelling construction and in existing dwellings when the valuation of additions or alterations of habitable space exceeds $1,000.
3. Smoke detector locations:
    a. In dwelling units a smoke detector shall be installed at a point centrally located in the corridor or area giving access to each separate sleeping area.
    b. A smoke detector shall be located in each bedroom or sleeping area.
    c. In garages, basements, workshops and storage rooms, when habitable area exists above, a smoke detector shall be centrally located on the ceiling. In storage rooms when located within the dwelling.
    d. In dwellings more than one-story or with split levels; a smoke detector shall be located on the first level and at the top of the stairs on all other levels.
    e. If a dwelling has a vaulted ceiling, a smoke detector shall be located between 12" and 18" below the peak of the ceiling or to the bottom of a ridge beam. When ceiling elevations differ by 24" or more a smoke detector shall be installed on the higher ceiling.
    f. Smoke detectors installed on walls or ceilings shall be kept a minimum of 12" away from the corner.
    g. Smoke detectors, located in a. through e above and are powered by house wiring, shall be wired to be audible simultaneously with all smoke detectors and in sleeping areas.

Fire Resistive Occupancy Separations in Dwellings

1. Occupancy separations (fire walls and ceilings) are required:
    a. Between a dwelling and a garage.
    b. Between a dwelling and a storage room or workshop in excess of 50 square feet.
    c. Between dwelling units of a duplex.
2. Construction of an occupancy separation is to provide a complete fire resistive sheetrock separation, and to protect openings and penetrations with approved material, on the garage or storage side of the fire wall and ceiling.

3. Typical methods:
    a. ⅝" Type X sheetrock on the common walls and the ceiling and any wall or member supporting the ceiling, on the garage or storage side.
    b. 6" minimum solid log wall, 8 x 8 wooden posts and 6 x 10 horizontal wooden beams, actual minimum dimensions, are adequate for fire separation. Ceilings shall be fire rocked in all cases.
    c. ⅝" Type X sheetrock on both sides of 2 x 4 studs 24"oc on the common wall up to the roof sheathing, and in the crawl space in wood floor construction. (Duplex only.)

➲ NOTE **When habitable area exists above the garage or storage the supports for the sheetrock ceiling shall be spaced 16"oc maximum.**

4. Openings:
    a. 1⅜" solid core or a 20 minute labeled fire door. Doors shall be self-closing. Between duplexes 1 hour fire rated assembly.
    b. Attic access through a fire-resistive ceiling between a garage and a single family dwelling shall be an approved assembly; ⅝" Type X sheetrock glued and screwed to ¾" plywood supported by ⅝" Type X drywall edge in the opening.
    c. Duct openings into the garage shall be protected with a fire damper, and a back draft damper.
5. Penetrations through the fire wall or ceiling on the garage or storage side. Ducts, pipe, conduits, and electric boxes shall be metal or rated 1 hour fire resistive.
6. Enclosed areas under stairs shall be protected with ⅝" Type X sheetrock.

Attic Access

A 22" x 30" minimum access is required for every attic space with 30" or more vertical clearance. When equipment is located in attic spaces, the access opening shall be sized 30" x 30" or large enough for removal of equipment.

Decking Board Spacing

Decking boards shall be spaced no greater than¼" maximum space between.

Planters

Masonry planters shall have a 2" air space minimum between the masonry and the wood frame wall. When the air space is less than 6", a flashing shall be installed between the planter and the wall with provisions made for air to circulate within the space. The frame wall shall be covered with approved exterior wall coverings.

SFD Heating

Every dwelling, when equipped with a wood stove or solar for heat, shall be accompanied by a conventional and permanent heating system fueled by gas or electric to maintain a constant temperature of 70 degrees, 3' above the floor.

In areas where no commercial electric power is available, we recommend L.P. gas heating appliances be installed to protect plumbing from freezing or install the building water distribution piping to completely drain down.

Minimum Size Dwelling Units

The minimum sized dwelling unit for a single family dwelling, each unit of a duplex, lodging house or a congregate residence shall be 480 square feet. These dwelling units shall meet all applicable code requirements.

Sanitation in Dwelling Units

1. A dwelling unit shall be provided with a kitchen equipped with a kitchen sink. Dwelling units shall be provided with a bathroom equipped with a water closet, lavatory, and a bathtub or shower. Each sink, lavatory and bathtub or shower shall have hot and cold running water.
2. A water closet shall be located in a space not less than 30" wide and a clear space in front of not less than 24".

Temporary Occupancy

1. Temporary occupancy will only be granted to homes of owner builders.
2. The home shall have a completed kitchen, bathroom, and bedroom.
3. All smoke detectors shall be in place.
4. The one required exit shall be complete with a landing and steps to grade. Other doors where decks or landings are not complete the doors shall have guard rails built over the opening. Interior stairs shall be complete. All bedroom escape windows shall be complete.
5. All plumbing drains and vents shall be properly terminated with fixtures, capped off or through the roof for vents.
6. All electric shall be trimmed out.
7. All hazardous situations shall be addressed by the inspector for safe operation and occupancy.

Accessory Structures

Floor Level in Garages

1. The floor elevation of an attached garage slab shall be 3½" minimum and 8" maximum lower than the finish floor height of the house, except when steps are provided.
2. The garage slab shall be sloped ⅛" per foot toward the garage door for drainage.

Plumbing in Accessory Structures

1. The only sanitary plumbing fixtures allowed in a detached accessory structure are a water closet, one lavatory and a laundry space, when approved by the Building Official.
2. Laundry rooms, when permitted in a garage, shall have a floor level of 8" above the garage floor.
3. Plumbing in restroom and laundry spaces, when allowed in garages and accessory structures, the buildings shall be insulated or the spaces enclosed, heated, and insulated. Exposed water piping shall be insulated. Heating equipment and water heaters shall be elevated 18" minimum above the floor in garages.

Attached Accessory Structures

1. Any accessory structure closer than 6' between eaves to the main structure shall be attached by a roof structure, conventional type framing, valleyed in or tied in securely with waterproof roof covering.
2. An accessory structure located 8' or more between exterior walls to the main structure shall be considered attached when connected to an uncovered deck or any accessory structure.
3. In cases 1 and 2 above, the attached accessory structure shall have a fire resistive separation wall and ceiling, when required, between the attached accessory structure and the main dwelling structure.

Modular Homes

Permits and Construction Standards

1. A modular home, built at the factory and brought in on wheels will require a building permit. A modular home or factory built building is built according to the Uniform Building Code and will have a blue Arizona identification number label affixed.
2. Foundations for modular homes shall be an engineered system and built according to the Uniform Building Code.

3. A modular home in residential zones shall be approved and constructed according to County Planning and Zoning standards for: permanent foundation installation, type or siding, length of overhang, pitch of roof, etc.
4. A modular home constructed and/or erected at a permanent site location shall go through the same plan review, permit and fee process of all other single family dwelling permits. The valuation for a modular home shall be one half that of a conventionally site built single family dwelling.

Manufactured Homes

Permits and Construction Standards

1. Permits shall be issued for the installation of manufactured homes in mobile home parks and on private parcels the cost of which is $150.00. There will be an additional $10.00 fee for a new propane connection and $20.00 for new electrical connection.
2. Three site plans, a copy of a title or a copy of the bill of sale to show year of home and number of bedrooms, and proof of a valid septic permit or hook up to a public sewer system shall be accompanied by a completed mobile home permit application form.
3. Manufactured homes are built according to HUD standards and will have affixed a red Arizona identification number label. Manufactured home installations are according to the State of Arizona Office of Manufactured Homes for: footing and pier setup; water; sewer; gas and electric service; feeder and house panel.
4. Separate permits are required for manufactured home additions, covered and uncovered decks, garages, carports, interior remodeling, and wood stoves.
5. Permanent manufactured home installations shall be set on a permanent perimeter foundation stem wall and footing of which will require a separate building permit. The foundation shall meet county standards for a mobile home foundation. ***See Foundation Detail on page 70***.
6. Mobile homes are manufactured units built before June 15, 1976. These homes are not allowed to be located in Coconino County according to the Zoning Ordinance unless they are rehabilitated to comply with recognized fire and life safety standards. A special inspection is required and the rehabilitation shall take place before a manufactured home permit is issued.

Log Cabins

1. All logs used in log construction shall be graded and stamped by a certified lumber grading agency. Logs which will be used for the walls do not require a stamp provided a letter is submitted by the supplied identifying the grade, species, and moisture content of the logs.
2. Plans for log homes or log structures shall include:
    a. Species and grade of logs used.
    b. Moisture content of logs. If the moisture content of the logs is excessive, greater than 19%, the home shall be designed for settlement and the plans shall show the methods and details for that purpose.
    c. Method of installation for the logs.
    d. Types of fasteners used and spacing requirements.
    e. Provisions for settling at all wall openings, load bearing posts, fireplaces, interior frame partitions, staircases, plumbing lines, and all non-settling portions of the building.
    f. Type of materials and methods used to seal and chink the logs.
3. Additional plans required for log homes shall include the architectural plans for a typical single family dwelling.

4. Plans must be stamped by a professional architect or civil/structural engineer licensed to practice in the State of Arizona when:
    a. Log structural members are used for other than wall logs, i.e.: main ridge beams, roof beams, rafters, roof purlins, posts, floor girders, floor joists, or other similar applications.
    b. The log structure exceeds two stories in height.
5. Plans required to be sealed by an architect or engineer must contain the following information:
    a. The grade, species, and moisture content of the structural logs.
    b. The fiber bending stress value of the logs.
    c. The design loads for the roof, floor, and deck log members.
    d. Engineering calculations for all applicable log structural members.
6. Provisions shall be made for plumbing, electrical and mechanical in solid log construction. The plans shall show details on the installation of these systems.
7. The Building Official may request an engineering analysis on any log structure where deemed necessary.

Plumbing

General Requirements

Minimum Standards

Each length of pipe, pipe fittings, traps, fixtures, material and devices used in a plumbing system shall be listed or labeled by a listing agency and shall have cast, stamped, or indelibly marked on it, the maker's name or mark, the weight and the quality of the product.

Disposal System

Every building in which plumbing fixtures are installed; the drainage system shall be connected to an approved public utility, private sewer system or to a private sewage disposal system permitted by the County Health Department.

Water Service

1. Every building in which plumbing fixtures are installed shall have its fixtures connected to a potable water system (safe for drinking and domestic use) so arranged to keep them flushed clean and sanitary. The water line serving a building shall be located on the parcel of the building served unless a legal easement exists.
2. Water supply piping shall be installed so as to prevent backflow, cross connection or connections into a contaminated water source.
3. At the fixtures: hot water supply shall be located on the left and the cold on the right hand sides.
4. Any lot or parcel at which a dwelling is located and no water utility provides service, a private water system shall be installed meeting these minimum requirements:
    a. 500 gallon storage tank minimum to be filled by hauling water.
    b. Pressurized system by use of a pump.
    c. Piping system installed per code and protected from freezing.

Workmanship

1. All design, construction, and workmanship shall conform to accepted engineering practices.
2. It is unlawful to conceal cracks, holes, or imperfections in materials by any means.
3. Burred ends of all pipe and tubing shall be reamed to full bore and all chips shall be removed.
4. ABS pipe and fitting shall be cleaned and then joined with listed solvent cement. CPVC and PVC pipe and fittings shall be cleaned and joined with listed primers and solvent cements.

Protection of Piping, Materials, and Structures

1. All piping passing through footings, stems or slabs shall be sleeved and shall not impair the structure's integrity. Sleeves shall be sealed on both ends. Piping shall not be stressed at any point, by the structure.

2. All piping passing through or under cinders or other corrosive materials in any location shall be protected in an approved manner. Copper pipe embedded in cinders and penetrating a slab shall be sleeved for protection with a poly sleeve for its entire length.
3. Trenches for piping deeper than the structure's footing and parallel shall be located at a 45 degree angle away from the structure.
4. Piping not approved for use under or in the building shall stop 2' outside the building perimeter.
5. Water piping subject to freezing in locations, such as exterior walls, crawl spaces, attics, and garages shall be protected by approved methods.
6. Piping depth outside below grade:
    a. Drainage: 12" of cover or protected.
    b. Water: 30" minimum for freezing.
    c. Gas: 12" minimum for protection.
7. All pipe penetrating a fire-resistive/rated floor-ceiling, roof-ceiling or wall shall be metal or protected by a listed 1 hour rated penetration assembly.

Trenching

1. Trenches containing piping shall remain open until the installation is inspected.
2. Piping shall be laid on a fine layer of bedding cinders, sand or clean earth.
3. Trenches shall be backfilled in thin layers to 12" above the top of the pipe with bedding cinders, sand or clean earth which shall not contain stones, boulders, cinders or other material which would cause damage or corrosive action to the pipe.
4. Sewer and water pipes in the same trench:
    a. Building sewers or drainage piping of clay or materials which are not approved for use within a building shall not be run or laid in the same trench as the water pipes unless **both** of the following requirements are met:
        1. The bottom of the water pipe, at all points, shall be at least twelve (12) inches (0.3m) above the top of the sewer or drain line.
        2. The water pipe shall be placed on a solid shelf excavated at one side of the common trench with a minimum clear horizontal distance of at least twelve (12) inches (0.3 m) from the sewer or drain line.
    b. When a water pipe crosses a sewer pipe of materials which are not approved for use within a building, the water pipe shall be sleeved to 10' either side of the intersection and the sleeve shall be sealed.
5. Other pipes in the same trench: Piping laid in a trench on the same level or at different levels shall not be laid above another pipe but shall be separated to the side a minimum of 12" between the pipes.

Testing

1. Drainage system:
    a. A test shall be performed on the drainage system for under slab plumbing before the slab is poured and the entire system shall be tested at the time of the rough inspection before drywall.
    b. Water test - a water test shall be applied to the drainage and vent piping. All openings in the piping shall be tightly closed, except the highest opening which is filled with water to over flowing, to a point 10' minimum above the highest fixture opening. The water level shall be maintained for 15 minutes.
    c. Air test - tightly close all openings except on one opening. Install an air inlet-pressure gauge assembly. Pressurize the system with air to 5psi and the pressure shall be maintained for 15 minutes.
2. Water system:
    a. At the time of the rough plumbing inspection, a test shall be performed on the entire water supply system. Tightly close all openings except on one opening, install an air inlet-pressure gauge assembly. Pressurize the system with 50psi and the pressure shall be maintained for 15 minutes. Water with a minimum working pressure of 50psi may be substituted.
    b. Water pipe yard lines that have glued joints and are not continuous below grade shall be pressure tested as in 2.a above.

3. Gas system: The test as performed in #2 (water system) above with the pipe pressurized to 10psi for 15 minutes. Two stage gas systems, the first stage medium pressure piping shall be tested with 60psi for 30 minutes.
4. All required piping tests shall be inspected prior to concealment or backfill.
5. Test gauges:
    a. Required pressure tests of 10psi or less shall be performed with gauges in 1/10 pound increments or less.
    b. Required pressure tests exceeding 10psi, but less than 100psi shall be performed with gauges in 10 pound increments or less.

Piping Installation

1. Changes in direction of piping systems shall be made with the appropriate fitting to make that change.
2. Glue used for plastic pipe shall be approved for the type of pipe used.
3. Inspection: No drain waste and vent piping system, water supply system or gas piping system shall be covered or concealed until it has been tested, inspected, and approved.

Hangers and Support

1. Vertical and horizontal piping shall be secured at sufficiently close intervals to keep the piping in alignment, prevent sagging and carry the weight of the piping and its contents when fully loaded.
2. Any type of vertical piping shall be supported at its base, at directional changes, at each floor level, at the roof line and maximum intervals of 10'.
3. Horizontal piping:
    a. Cast iron soil pipe at each joint and at 5' maximum intervals.
    b. Screwed pipe: ¾" and smaller, 10' maximum intervals. 1" and larger, 12' maximum intervals.
    c. Copper tubing: 1½" and smaller, 6' maximum intervals. 2" and larger, 10' maximum intervals.
    d. Plastic pipe: 4' maximum intervals.
    e. Pipe in the ground: piping shall be supported for its entire length by sand or clean earth.
4. Hanger and anchors:
    a. Material - hangers and anchors shall be of material of sufficient strength to maintain their proportionate share of the weight of pipe and its contents
    b. All piping, fixtures, and equipment shall be adequately supported to the satisfaction of the building department.
    c. The structural members supporting the pipe shall be designed to carry the weight of the pipe and its contents.

Drainage System

Drain, Waste, and Vent Piping (DWV) Material

1. Piping allowed inside a building ABS or PVC plastic pipe schedule 40 DWV is minimum inside a building. Other materials may be used for DWV inside a building such as cast iron or copper subject to the limitations of the code.
2. Piping allowed outside a building: ABS or PVC plastic sewer piping SDR 35 minimum. Materials allowed inside a building subject to the limitations of the code may be used as well.
3. Fittings: Fittings for DWV systems shall be approved for the type of pipe used.

Fixture Unit Equivalents

The unit equivalent of plumbing fixtures is based on the size of the trap required and is shown in ***Table P-1***.

Table P-1: Fixture Unit Equivalents - Residential Only			
Kind of Fixture	**Trap and Trap Arm Size**	**Fixture Units**	**Drain Pipe Size**
Bathtubs	1½"	2	1½"
Bidets	1½"	2	1½"
Floor Drains	2"	2	2"
Laundry Tubs	1½"	2	1½"
Laundry Standpipe	2"	2	2"
Shower (Residential)	2"	2	2"
Lavatories	1¼"	1	1½"
Lavatories (Double)	1½"	2	1½"
Bar Sink	1½"	2	1½"
Kitchen Sink with or with out dishwasher	1½"	2	2"
Water Closets	3"	4	3"
Urinals	2"	2	2"

Size of DWV Piping Systems

The sizes of DWV piping shall be determined from the total fixture units connected to the system and shown in ***Table P-2***.

The minimum size of a building drain and sewer shall be 3", which is normally adequate for most two and three bathroom dwellings.

➲ **NOTE** **3" building drain maximum 35 fixture units. Maximum 3 water closets on 3" building drain. See note 4 in Table P-2.**

Table P-2: Maximum Unit Loading and Length of Drainage and Vent Piping					
Pipe Size	**1¼"**	**1½"**	**2"**	**3"**	**4"**
Maximum Units Drainage Piping[1]					
Vertical	1	2[2]	16[3]	48[4]	256
Horizontal[5]	1	2[2]	8[3]	35	216
Maximum Length Drainage Piping - Vertical and Horizontal - Unlimited for Single Family Dwellings					
Maximum Units	1	8[3]	24	84	256
Maximum Length (feet)	45	60	120	212	300

➲ **NOTES:** 1. Excluding trap arm; 2. Except kitchen sinks and urinals; 3. Except water closets; 4. Only 4 water closets on any vertical drainage pipe and only 3 water closets on any horizontal drainage pipe; 5. Based on ¼" per foot slope down. For ⅛" per foot slope down, multiply horizontal fixture units by a factor of 0.8.

Grade of Horizontal DWV Piping

1. Horizontal piping shall be run with a slope of¼" per foot toward the point of disposal.
2. When structural conditions prevent this, a slope of ⅛" per foot may be used.
3. Long runs of pipe requiring greater slope, drops of 45, 60 or 90 degrees down shall be made and the piping between shall maintain¼" per foot slope.

Cleanouts

1. Cleanouts are required at the upper terminal of all horizontal drain piping at the foot of the vertical stack.
2. Cleanouts at all kitchen sinks, laundry standpipes, and urinals shall be required.
3. Cleanouts are required at the junction of the building drain and the building sewer and one located every 100'.
4. Cleanouts are required in a horizontal drain line for each change of direction exceeding 135 degrees.
5. Each cleanout shall be installed so it opens opposite to the flow or at right angles.
6. Cleanouts shall be readily accessible: up to grade, through access doors in floors, walls and ceilings, or extended to the outside of a building when inaccessible in the crawl space.
7. Clearance in front of cleanouts is 12" for pipe 2" and smaller and 18" for pipe larger than 2".
8. Clean out fitting shall be approved type and designed to be gas and water tight without the use of a gasket or washer.

Traps and Vents Required

1. Traps required: Each plumbing fixture, except those having integral traps, shall be separately trapped by an approved water seal type trap.
2. Vents required: Each plumbing fixture trap shall be protected against siphonage and back pressure and air circulation assured throughout all parts of the drainage system by a vent pipe installed per code.
3. Distance between trap and vent: The vent shall be located such that the trap arm length to the vent does not exceed the distances in ***Table P-3***. The trap arm length is measured from the trap weir to the inner edge of the vent pipe.

Table P-3: Trap Arms

Horizontal Distance of Trap Arm					
Trap arm size	1¼"	1½"	2"	3"	4"
Trap arm Length	2'6"	3'6"	5'0"	6'0"	10'0"
➲ **NOTE:** The trap and trap arm shall be the same size.					

Vent Installations

1. The drainage system shall be vented by one or more vent pipes, the aggregate cross sectional area shall be not less than the largest required building sewer.
2. A vent pipe shall rise vertically not less than 6" above the fixture it serves before it offsets horizontally.
3. The vent pipe opening, except for water closets, shall not be below the weir of the trap.
4. Vents, connecting to horizontal drainage pipe, shall have its opening above the drainage pipe center line, down stream of the trap served.
5. Two fixtures may be served by a common vent when the fixtures drain into an approved double fitting, having inlets at the same level.

6. Vent pipes shall rise undiminished in size or increase in size as other new pipes are connected and sized according to the fixture units connected.
7. Vent pipes run on the outside of a building shall be enclosed in a chase.

Vent Terminations

1. Each vent pipe shall extend through its flashing to 6" above the roof and at least 1' away from a vertical surface.
2. Each vent pipe shall be at least 10' horizontally from or 3' above any window, door, or air intake.
3. Frost or snow closure: in cold areas, vent pipes extending through the roof, the minimum pipe size shall be 2" but not smaller than the required pipe size. Pipe size change shall be made 1' below the roof and extend a minimum of 10" above the roof.

Laundry Standpipe Receptor

A standpipe for an automatic washer shall not extend more than 30" nor less than 18" above its trap. A trap for such standpipe shall not be installed below the floor, but shall be roughed-in not less than 6" and not more than 18" above the floor. ***See Piping Detail, page 63***.

Loop Vents

Approved loop vents shall be used for island sinks and when vents cannot extend upward because of log walls or other structural impairments. ***See Piping Detail, page 63***.

Dishwasher Connection

No domestic dishwashing machine shall be directly connected to a drainage system or garbage disposal without the use of an approved dishwasher air gap fitting on the discharge side of the dishwasher. ***See Piping Detail, page 63***.

Back Water Valve

In areas where deemed necessary, an approved back water valve shall be installed outside the structure on the building sewer.

Water Piping

Water Distribution Materials

1. Materials for use inside a building: Copper, Type L and K tubing or pipe, galvanized steel water pipe, CPVC pipe for hot and cold water and PEX (cross linked polyethylene) tubing or pipe for hot and cold water.
2. Materials for use outside a building: PVC, PB and PE pipe and tubing listed for cold water building supply and yard piping. Materials for use inside the building subject to the limitations of the code may be used as well. Galvanized, steel pipe is not adequate protection for buried pipe. Steel pipe, buried, shall have a protective coating machine applied and joints field wrapped.
3. Fittings: Fittings for water distribution systems shall be approved for the type of pipe used.
4. Piping under slab: Type L copper minimum with no joints unless silver soldered and fittings are wrought copper. No plastic or galvanized steel pipe allowed under a slab.
5. Solders and fluxes with a lead content which exceeds .20 of 1% are prohibited.
6. Copper tubing marking:¼" Colored Stripe - Type K Green, Type L Blue, Type M Red.
7. Listed flexible copper water connectors shall be installed in exposed locations.

Water Pressure

1. Inadequate pressure: Whenever a pressure of 15psi cannot be maintained, a pump with a tank shall be installed to provide the minimum pressure.
2. Excessive water pressure: Whenever a pressure is in excess of 80psi, a pressure regulator shall be installed to reduce pressure to the maximum of 80psi.

Shutoff Valves

1. Shut off valves shall be located:
    a. On the discharge side of the water meter or at the tank for an unmetered system, behind a back flow valve.
    b. On the cold water supply of each hot water heater.
    c . On the supply line to each separate building on a parcel or lot.
    d. On the supply lines, ahead of the slip joints, for all fixtures.
2. Shut off valves shall be readily accessible.
3. The shut off valve outside of a building shall be an approved stop and waste valve or a gate valve.

Vacuum Breakers and Back Flow Devices

1. Water faucets over sinks and other fixtures shall be located above the flood rim of such fixtures so there is an air gap of these minimum dimensions:
    a. 1" Bathroom lavatories.
    b. 1½" Kitchen sinks, laundry sinks.
    c. 2" Bath tub fillers.
    d. 2 times faucet opening for openings greater than 1".
    e. When an air gap is impossible for swimming pools, lawn sprinklers, or hose bibs, etc., an approved back-flow prevention device shall be installed.
2. In areas where water pressures fluctuate, an approved back flow device shall be installed on the customer's side of the meter before the dwelling.
3. Vacuum breakers shall be installed on hose bibs.

Frost Protection

1. Hose bibs in exterior locations or other areas subject to freezing shall be frost proof.
2. Plumbing located in a garage such as laundry tubs, washing machines or other plumbing shall be protected from freezing by frost proof fixtures, areas enclosed and heated, heat taped and insulated or other means of protection.
3. Plumbing located in exterior walls, the piping shall be insulated, run on the interior side of the stud space, then the normal wall insulation laid between the piping and exterior side of the stud space.

Water Pipe Sizing

1. Water pipe sizing for yard lines, building main lines and building branch lines are determined by the Uniform Plumbing Code.
2. The yard line for a dwelling shall be ¾" minimum. When the dwelling contains more than two bathrooms or the yard line is in excess of 80', consult the Uniform Plumbing Code for larger yard lines.

Pressure and Temperature Relief Valve (P&T RV) and Thermal Expansion Control

1. Storage type water heaters shall have an adequately sized, approved and listed combination pressure and temperature relief valve (P&T RV). Listed non-storage instantaneous water heaters having a diameter not more than 3" are exempt.

2. The pressure and temperature relief valve shall be piped to the outside with hard drawn copper, galvanized steel or CPVC piping. It shall be sized to the full bore of the valve outlet. The pipe shall be run continually downward and have no traps.
3. The piping shall terminate outside the building not more than 2' or less that 6" above grade, and shall point toward the ground. The terminating end shall not be threaded. Such drains may terminate at other approved locations.
4. A water heater centrally located in a dwelling with no path to the outside through interior walls shall have its PRV piped under the slab to terminate outside.
5. Thermal expansion control: An approved listed expansion tank or other device designed for intermittent operation for thermal expansion control shall be installed whenever the building supply pressure is greater than the required relief valve pressure setting or when any device (back flow prevention device) is installed that prevents pressure relief through the building supply. The tank or device shall be sized in accordance with the manufacturer's recommendation.
6. Any water system with a check valve or pressure regulating device without a bypass feature shall be provided with an adequately sized approved and listed pressure relief valve with a drain as stated above.
7. No shutoff valve shall be installed between a relief valve and the system or in the drain line.

Dielectric Insulator

Dissimilar metals when used in a water piping system, such as copper and galvanized steel pipe, shall be separated by a dielectric insulator.

Water Heaters

Water Heater: An appliance designed to supply hot water and equipped with automatic controls limiting water temperature to a maximum of 210º F. Boilers which operate at temperatures in excess of 210º F would be regulated by the Uniform Mechanical Code.

Clearances to Combustible Construction

Clearances of listed appliances from combustible material shall be as specified in the listing or on the rating.

Prohibited Locations

1. Water heaters and boilers shall not be located in a room used or designed to be used as a bedroom, bathroom, clothes closet, or in any enclosed space with access only through such a room, and under stairways. This includes gas or electric water heaters and boilers.
2. Liquid propane gas water heaters shall not be located in a pit or basement. See Mechanical Section for ***LPG Appliances, number 2, page 44***.

Protection from Damage

1. Appliances located in a garage shall be guarded against damage by protective barrier or located out of the normal path of vehicles.
2. Water heaters located in garages which generate a glow, spark or flame capable of igniting flammable vapors shall be installed with the pilots and burners or heating elements and switches at least 18" above the floor level.
3. When dissimilar metals are used in the water piping to a water heater, a dielectric insulator shall be used.
4. Water heaters supported from the ground shall rest on a concrete pad extending 3" above the ground.
5. Water heaters located in an attic or furred space where damage may result from a leaking water heater, a watertight pan of corrosion resistant materials shall be installed beneath the water heater with a minimum ¾" drain line run to an approved location.

Access and Working Space

1. A water heater compartment shall have a 24" wide door.
2. Attic access leading to a water heater shall be 30" x 30".
3. Any access passageway shall be no greater than 20' to the hot water heater.
4. Water heaters in attic or furred spaces shall have a solid floor passageway 24" wide from the access opening to the water heater. Also, a solid floor working platform shall be provided 30" wide and 30" deep in front of the fire-box.
5. Attic and underfloor water heater locations shall be provided with a light, a switch at the access opening, and an electric outlet.

Combustion Air

1. Gas burning water heaters shall be assured a sufficient supply of combustion air.
2. For combustion air supply: openings and ducts, sources of combustion air, prohibited sources, and unusually tight construction, follow the combustion air requirements, numbers 2 through 6 and 8, ***pages 46 through 48*** in the Mechanical Section of this book.
3. Area of combustion air openings:
    a. Water heaters installed in enclosures and obtaining combustion air from two openings through walls or doors into inner spaces of buildings of ordinary tight construction: opening shall be 1 square inch per 1,000 BTU input rating and each opening shall be 100 square inches minimum.
    b. Water heaters installed in enclosures and obtaining combustion air from two openings through exterior walls to the outside, each having 1 square inch per 4,000 BTU input rating.
    c. Sizes for other combustion air opening situations: follow combustion air requirements, number 7, ***page 47*** in the Mechanical Section of this book.
    d. In all cases, 2 openings, upper and lower, shall be provided for combustion air into enclosures or confined spaces, such as water heater closets, laundry, or utility rooms.
    e. Combustion air openings shall terminate in a space at least 3" in depth open to the front or side of the appliance. Such space shall extend from the floor to the ceiling of the appliance enclosure.
    f. Combustion air ducts shall not pass through construction where fire dampers are required. Volume air dampers shall not be installed in combustion air duct.
    g. Openings shall serve a single enclosure and opening areas shall not be diminished by louvers, grills, screens for the required free area calculation.
    h. Confined space: a confined space is an enclosure with a volume of less than 50 cubic feet per 1,000 BTU input rating of the water heater installed within.

Vents

Follow venting requirements in the Mechanical Section of this book, ***pages 48 through 49***.

Gas Piping

Gas Piping Materials

1. Materials for use above ground and in the building are black or galvanized steel pipe.
2. Steel pipe for underground: Installation shall have a protective coating machine applied, such as scotch coat. This pipe shall include small sections and risers to 6" above grade.
3. Approved PVC or PE plastic gas pipe for yard line only.
4. Copper tubing is not allowed.

Gas Shut-Off Valves

1. A gas piping shut-off valve is required on the piping ahead of the flex at each furnace, water heater or any other gas burning appliance.
2. A gas piping shut-off valve shall be installed on the main gas supply piping located outside and adjacent to the building, 6" minimum above grade.
3. All gas shut-off valves shall be accessible.

Gas Piping Connection to Gas Fueled Furnace and Appliances

A rigid connection shall not be allowed between appliances and the gas piping system. The connection shall be made to a rigid nipple outside the appliance with an approved flexible appliance connector.

Gas Flex Connectors

If a gas flex connector, at a LPG tank connecting to the gas piping system is used, a mobile home approved flexible connector shall be required.

Installations

1. Gas piping is not allowed in or on the ground under any structure or slab.

   Alternate Installation:
   a. Piping in a slab may be installed in recess channels.
   b. Piping under a porch slab or driveway shall be sleeved and vented.
2. Joints of screwed pipe shall be made up with approved joint material insoluble in the presence of gas, applied to male threads only.
3. The joints and damaged coatings of underground pipe shall be field wrapped to provide equivalent protection and shall be a minimum of 20 mil tape.
4. Plastic gas pipe for yard line shall be laid with an insulated #18 copper tracer wire.
5. Fittings, valves and devices used for LP gas shall be approved for LP gas.
6. Underground ferrous gas piping shall be electrically isolated from the rest of the gas piping system with listed isolation fittings installed, on the discharge side of the shut-off a minimum of 6" above grade.
7. When propane gas is used in the gas piping system, a drip leg shall be installed after the shut-off and union before the pipe enters the building or at each appliance after the shut-off and before the flex connector. Check manufacturer’s specifications of gas appliances for additional drip leg requirements.

Mechanical

General Requirements

Fuel Connection

1. Each appliance shall be designed and labeled for use with the type of fuel to which it will be connected.
2. The serving gas supplier may convert appliances to a different fuel with approved procedures when properly relabeled. Other qualified servicemen may convert appliances provided they first obtain approval from the building official.
3. Each appliance shall be rigidly connected to the gas piping or with an approved gas flex connector.

Shut-Off Valves

1. An accessible approved shut-off valve shall be installed in the gas piping outside of each appliance, ahead of the union and approved flex connector. Such valve shall be within 3' of the appliance it serves.
2. Shut-off valves may be accessibly located inside or under appliances or wall heaters provided maintenance or removal can be performed without removal of the shut-off valve.
3. When a single family dwelling is equipped with gas piping, it shall have an approved gas shut-off valve on the piping located outside and adjacent to the building, 6" above grade.

Installation

1. The appliance installer shall leave the manufacturer's installation and operating instructions attached to the appliance.
2. The appliance shall be installed according to the manufacturer's specifications.
3. Appliances intended for installation in closets or alcoves, on combustible flooring, in attics and exterior locations shall be listed and approved by the manufacturer for such locations.
4. A furnace supported from the ground shall rest on a concrete slab extending 3" above the adjacent grade.
5. Clearances to combustibles for listed heating appliances shall be according to manufacturer's specifications or for unlisted heating appliances according to UMC 504 and UMC Table 5-A.

Liquid Propane Gas (LPG) Appliances and Water Heaters

1. LPG appliances shall not be installed in a pit or a basement.
2. LPG appliances located in an above grade under floor space shall be provided with an approved drain to the outside for removal of unburned gas. ***See Furnace Details, pages 73 and 74***.

Access and Working Clearance for Furnaces

1. A furnace room shall have a door or opening 24" minimum or larger to allow removal of the largest piece of equipment.
2. 30" x 30" minimum access through stemwall for underfloor furnace or through the ceiling or gable end wall for an attic furnace.
3. The furnace shall be installed so as to permit removal without disturbing piping, conduit, other equipment, or permanent construction.
4. An unobstructed working space in front of the entire firebox 30" deep and as high as the furnace (when the door of the furnace enclosure is open or in other installation) for service or replacement of air filters, valves, vent collars and controls. In no case shall the space be less than 30" wide, 30" deep, and 30" high.
5. Furnace installations in attics shall be provided with a 24" wide solid floor passageway from the access to a 30" platform in front of the entire firebox. All portions of the furnace requiring service shall be made accessible by a platform. ***See Furnace Detail, page 75***.
6. Suspended furnaces in under floor spaces shall have 6" clearance from the bottom of the furnace to the ground extending 12" to the sides and 30" at the firebox.
7. Distance from the furnace to the access opening shall not exceed 20'.
8. Furnace installed on the roof and exterior locations, unit heaters, vented wall heaters, and vented decorative appliances; see applicable sections in the UMC.

Lighting at Furnace

1. A permanent electric outlet and lighting fixture shall be provided at or near the furnace, controlled by a switch at the required access or passageway opening.
2. In a dwelling or garage the interior lighting may be sufficient.

Electrical Connections

1. Heating and cooling equipment requiring electrical connections shall have a positive means of disconnect within sight from the equipment served.
2. A 120 volt receptacle shall be located within 25' of the equipment for service and maintenance.
3. Low voltage wiring of 50 volts or less for thermostat control shall be protected from physical damage. Such wiring, exposed to weather, shall be installed in an electrical conduit approved for exterior use.

Location

1. Appliances located in a garage shall be guarded against damage by protective barriers or located out of the normal path of vehicles.
2. Furnaces and heating equipment located in a garage, which generates a glow or spark or flame capable of igniting flammable vapors shall be installed with the pilots and burners or heating elements and switches at least 18" above the floor level.

Prohibited Locations for Furnaces

1. In a closet less that 12" wider than the furnace or when the closet provides working space less that 3" along the sides, back and top.
2. In a room used or designed to be used as a bedroom, bathroom, clothes closet or in any enclosed space with access only through such a room; under a stairway. This includes any gas or electric furnace.

3. In hazardous locations.

> **➲ NOTE** **A furnace in an enclosed space with combustion air obtained from outside the building and having a tight fitting gasketed door that is self- closing, may have access through a bedroom or bathroom.**

4. Exterior locations unless listed for such locations or in a weatherproof enclosure.

Ducts

1. Gypsum products shall not be exposed in ducts and plenums of air conditioning units where the temperature will reach below the dew point or 50º F.
2. Contamination prevention: Exhaust ducts under positive pressure and venting systems shall not extend or pass through ducts or plenums.
3. Duct openings, in a garage or storage area that are connected to a dwelling furnace shall be protected by a fire damper. Also, a back draft damper shall be required in the duct so odors and fumes shall not infiltrate back into the dwelling.
4. Piping or ducts for a central vacuuming system located in a garage which penetrates the fire wall of the dwelling shall be metal or when PVC it shall have a through penetration fire stop rated for 1 hour installed at the wall.

Decorative Appliances

1. Gas fireplaces and gas log appliances shall be equipped with a listed device or devices which will shut off the fuel supply to the main burner or burners in the event of pilot or ignition failure.
2. Gas decorative appliances, fireplaces and room heaters may be unvented provided they are listed, tested, and equipped with an oxygen depletion sensor and approval is based on a current evaluation report by an approved agency. These appliances shall not be located in bathrooms, bedrooms, rooms which could be used for sleeping purposes, or manufactured homes. These appliances shall not be used for the required heating system of a dwelling unit or any other occupancy. These appliances may only be located in rooms provided there is fifty (50) cubic feet of space per 1,000 BTU's of rating.
3. Gas logs installed in fireplaces or gas fireplace appliances shall have no damper or the damper shall be permanently blocked open.
4. Gas fireplaces or solid fuel fireplaces when installed in bedrooms shall be provided sufficient combustion air from the outside and doors installed on the fireplace front.

Combustion Air

Combustion Air Supply

1. Every fuel burning appliance shall be assured a sufficient supply of combustion air.

> **➲ NOTE** **Listed direct vent appliances, gas ranges, dryers, and refrigerators are exempt.**

2. Furnace closets or spaces in buildings of unusually tight construction where fuel burning appliances are located shall have openings to the outside or to other approved sources to supply combustion air.
3. Spaces in buildings of ordinary tight construction where fuel burning appliances are located when the volume of the space is equal to or greater than 50 cubic feet per 1000 BTU of the appliance located therein, infiltration may be regarded as supplying combustion air (adequate volume or unconfined space).

4. Openings and ducts:
    a. Approximately one half of the required area for combustion air openings shall be located within the upper 12" and the other half within the lower 12" of the enclosure. In all cases 2 openings, upper and lower, shall be provided for combustion air.
    b. Openings from the outside or crawl space shall be covered with¼" corrosion resistant mesh. Duct openings that originate in the attic, neither end of the ducts shall be screened.
    c. Ducts shall be galvanized steel 26 gauge minimum.
    d. Ducts shall have the same area as the required openings.
    e. The minimum dimension of any opening or duct is 3" and ducts shall not terminate closer than 3" off a floor.
    f. Ducts in attics shall extend above the thermal insulation or ceiling joists at least 6"
    g. Ducts supplying both upper and lower openings from a single source, two separate ducts or a single duct with a dividing partition shall be used to the source of the combustion air.

5. Sources of combustion air:
    a. Permanent openings to the outside: grills and ducts.
    b. An attic space sufficiently ventilated and having at least 30" clear vertical height at the peak.
    c. Under floor space may be used for lower openings when the area of the under floor vents to the outside are at least twice the area required for that combustion air opening. Under floor vent openings shall not be closable by louvers or any other means.
    d. Permanent openings communicating from inside areas which have an adequate volume of 50 cubic feet per 1000 BTU rating of appliances, in buildings of ordinary tight construction.

6. Prohibited sources:
    a. From a garage.

> ➲ **NOTE** **Fuel burning appliances may be located in a garage provided two openings properly sized and located to supply fresh air into the garage.**

    b. From areas where a fan may affect the flow of combustion air.
    c. A positive pressure separation shall be maintained between the combustion air and the return air of an appliance.

> ➲ **NOTE** **The return air inlet shall not be located within 10 feet of any appliance firebox or draft diverter in the same enclosed room or confined space.**

7. Area of combustion air openings:
    a. Unconfined Space (adequate volume).
        i. Spaces in buildings of unusually tight construction which have adequate volume require openings having a total free area of at least one (1) square inch per 5000 BTU rating of all appliances located in that space.
        ii. If the space is within a building of ordinary tight construction, infiltration may be considered as supplying combustion air.
    b. Confined space (inadequate volume).
        i. All inside air (ordinary tight construction only) Each opening shall have an area of one (1) square inch per 1000 BTU rating of all appliances located in that space with a 100 square inch minimum.
        ii. All air outside: Each opening shall have an area for vertical ducts, one (1) square inch per 4000 BTU rating, and for horizontal ducts one (1) square inch per 2000 BTU rating of all appliances located in that space
        iii. As an exception for two openings, when all air is taken from the outdoors for an appliance with a minimum clearance of one inch on the sides and back and six inches on the front, one opening shall be permitted and located within the upper 12 inches of the enclosure. The size of this opening or duct shall be a one square inch per 3,000 BTU rating but no smaller than the vent flow area.
        iv. Inside and outside air – two openings as located and sized in item 1 above and one opening to the outside having an area of one (1) square inch per 5,000 BTU rating of all appliances located in that space.

8. Unusually tight construction is construction where:
    a. Walls and ceilings exposed to the outside have a continuous vapor barrier with all openings gasketed or sealed.
    b. Weather stripping on openable windows and doors.
    c. Caulking or sealants are applied to areas such as joints around window and door frames, edges of panel and horizontal siding and at penetrations of plumbing, electrical, gas lines, and other openings.

Vents

Mechanical Vents

1. Venting of appliances: All fuel burning appliances shall be connected to an approved venting system.
2. Size of vent: The vent connector and vent shall have the same cross sectional area as the vent collar on the appliance.
3. Types of vents:
    a. Type B: Listed double wall vent for gas burning appliances.
    b. Type BW: Listed double wall vent for gas burning wall heaters.
    c. Type L: Listed vent for oil burning appliances.
    d. Wood stove metal chimney: Listed triple wall or insulated double wall for solid fuel.
    e. Single wall vent pipe: for vent connectors, vents that maintain minimum clearance to combustibles, and environmental air ducts for dryers range hoods and exhaust fans.
    f. Masonry chimney (lined or unlined).

Installation - Type B Gravity Vents and Other Vents

1. Gravity vents shall extend generally vertical with offsets not exceeding 45 degrees, although one 60 degree offset from the vertical may be allowed.
2. Angles greater than 45 degrees from the vertical shall be considered horizontal. The total horizontal run of vent and vent connector shall not exceed 75% of the vertical height of the vent.
3. A vent connector shall have a continuous rise of ¼" per foot.
4. Single wall metal vent connectors shall maintain clearance to combustibles as listed in UMC Table 3-C.
5. A single wall vent connector shall not go through an unoccupied space, Type B vent is required.
6. The vent shall be enclosed in a chase when passing through an occupied space or within 8' of the ground on an exterior wall.
7. Vents shall be supported to carry the weight at offsets, horizontal runs, and vertical rise.
8. Vents shall maintain listed clearances to combustibles.

Vent Termination

1. Venting systems shall terminate not less than 4' below or 4' horizontally from, nor less than 1' above any window, door or gravity air inlet into a building.
2. Venting systems shall terminate at least 3' above an outside air (e.g. combustion air) or make-up air inlet into a building, located within 10' horizontal.

➲ NOTE **Vents for direct vent appliances, with inputs not exceeding 65,000 BTU's shall be located 12 inches from an opening through which combustion products could enter the building.**

3. Type B and BW vents 12" in size or less shall not terminate less than 1' above the highest point of the roof through which it passes when at least 8' away from a vertical wall and the slope of the roof is 6/12 or less. A vent within 8' of a wall shall terminate at least 2' above that wall.

   Height above roof for greater slopes: 1'3" for 7/12; 1'6" for 8/12; 2'0" for 9/12; 2'6" for 10/12; 3'3" for 11/12; 4'0" for 12/12; 5'0" for 14/12; and 6'0" for 16/12.

4. The distance of termination shall be measured from the high point of the roof through which the vent passes to where the vent gases are discharged (the bottom of the cap).
5. Chimneys or vents for fireplaces, wood stoves and vents larger than 12" in size shall terminate 2' above any portion of the building or roof within 10' horizontal.
6. An appliance vent shall terminate in an approved listed cap or spark arrestor for wood stoves, fireplaces and any heating appliance with liquid or solid fuels.

High Efficiency Furnace

Any furnace that requires a condensate drain line shall have the condensate trap assembly be an integral part of the furnace unit, as per the manufacturer's specifications. Any other method, the design shall be reviewed and approved by the Building Official.

Condensate Waste Connections for High Efficiency Forced Air Heating Furnaces

1. Condensate waste connections in conditioned spaces:
   a. A waste line may connect into the tail piece of a sink before the trap.
   b. A waste line may connect into a floor sink or utility sink.
   c. A waste line may connect directly into the building drain system in a wall or space, provided it's fitting connections are approved fittings, are gas tight and it drains through a plumbing trap or an integrated trap of the furnace for the condensate line.
2. Condensate waste connections in unconditioned spaces:
   a. A waste line may connect directly into the building drain system in a crawl space, attic space, or garage provided the fitting connections are approved fittings, are gas tight and it drains through a plumbing trap or an integrated trap of the furnace for the condensate line. Also, the condensate line exposed in the unconditioned space shall be insulated to protect it from freezing.
   b. When structural conditions warrant, in remodel applications only, a condensate pump waste ejector may be used to dispose the water to a building drain line or to the outside. When the condensate is disposed to the outside, it shall waste to an approved location such as a sump hole filled with gravel for drainage and the piping arranged so as to prevent freezing and blockage of the line.

Wood Stoves

Wood Stoves

1. Listed wood stoves shall be installed according to manufacturer's specifications and clearances.
2. Unlisted wood stoves shall meet minimum County clearances. See amendments. See below.

Coconino County Unlisted Woodstove Clearances

1. 36" to combustibles when unprotected.
2. 18" to combustibles when protected by 26 gauge sheet steel or¼" non combustible mill board (listed) and a 1" convective air space.
3. 24" to combustibles when protected by 4" of brick on the wall.
4. 12" to combustibles when protected by 4" of brick and a 1" convective air space.

5. Stove pipe 18" to combustibles when unprotected. 9" to combustibles when protected by an approved heat shield.
6. Hearth protection for floor - brick or stone attached and mortared to the floor. Brick on mill board contained by a wooden frame.
7. Hearth extension: 18" front, 12" sides, 12" rear or to the protected wall.

Environmental Air Ducts

Range Hood, Dryer, and Exhaust Fans

1. Range hoods, dryers, and exhaust fans shall be vented to the outside through ducts (not into an attic space).
2. Ducts for these appliances shall be metal, non-corrosive and have a smooth interior surface. Plastic flexible dryer vent pipe may only be used to make the exposed connection from the dryer to the vent terminal. Dryer exhaust ducts shall not be connected with screws nor have a screen at the vent terminal. Exception bathroom exhaust fan ducts may be flexible aluminum.
3. Environmental air ducts shall have a back draft damper and shall terminate 3' from any building opening.
4. Bathroom exhaust fans shall be provided with makeup air to replenish air exhausted, obtained through the door into the house. A space under the door or by other means.
5. Makeup air for a dryer: When a closet is designed for the installation of a clothes dryer, a minimum opening of 100 square inches for makeup air shall be provided in the door or by other means.

> ➲ **NOTE** **The bottom of the door may be raised to provide an air flow of the required area.**

6. Ranges shall have a 30" minimum vertical clearance to combustibles unless protected overhead by a range hood and 24" vertical clearance.
7. Listed charcoal recirculating type range hoods are allowed.
8. Installation of a listed microwave oven over a listed cooktop range shall have clearances in accordance with the listing of both the cooktop and the microwave.

Electrical

General Requirements

Electric Service

Electric service locations and installations shall be according to APS specifications.

Minimum Service Size - NEC 230-79c

1. 100 AMP minimum size service panel.
2. 200 AMP minimum size service panel when electric heat is installed or supply load calculations and receive approval from the building official prior to issuance of permit.

Grounding Electrodes and Conductors Required - NEC 250-81, 94

1. #4, Uffer, bare copper conductor, attached to the footing rebar for a minimum of 20' with a minimum of 10' leader above grade for attachment to service equipment customers side (total 30' minimum).
2. Water bond, bare copper conductor, attached to available metallic water pipe sized; #4 copper for 200 AMP service or a #6 copper for 100 AMP service. Accessible - clamp connection.
3. All available grounding electrodes shall be bonded by unspliced grounding electrode conductors to the customer's side of the service main. Grounding electrode conductors for services larger than 200 amps shall be sized by NEC Table 250-94.

> ➲ **NOTE** **A butt splice may be approved when an approved crimp tool has been used.**

4. Pier construction or alterations:½" x 8" listed Copper ground rod with #4 bare copper conductor to service in place of uffer ground.

Panel Boards - NEC 240-24 and 384-5

1. Location: Panelboard shall not be located in clothes closets, bathrooms, firewalls, or in other areas inappropriate for the installation.
2. Clearances - NEC 110-16:
    a. 36" In front from floor to ceiling.
    b. 30" Wide in front.

Identification - NEC 310-12

Conductors shall be identified according to their use by distinguishing colors:

a. Grounding: green.
b. Neutral: white or gray.
c. Ungrounded (hot): colors other than green, white, or gray (normally black, red).

Aluminum Conductors - County Amendment

Aluminum conductors are limited to service entrance and/or feeder conductors only.

Electrical Metallic Tubing - County Amendment

Electrical metallic tubing (EMT) shall not be allowed as an underground raceway.

Romex - County Amendment

Romex is allowed in residential one and two family dwellings only. For multi-family residential, commercial and industrial, wiring shall be in a raceway.

Approved Underground Raceways

1. Rigid metal conduit.
2. Intermediate metal conduit (IMC).
3. Rigid non-metallic conduit (EPVC) Schedule #40 minimum, Schedule #80 for risers and exposed conduit subject to physical damage.
4. Conduits penetrating through a building slab from underground shall be rigid metal conduit or IMC.

➲ **NOTE** **The metallic conduits shall be wrapped with approved tape, half lapped with 20 mil of tape wrap, for a total thickness of 40 mils.**

Conductors/Branch Circuits - NEC Table 310-16

Conductors shall be sized according to the load served and protected by an overcurrent device of appropriate amperage.

Table E-1: Conductor Branch Circuits

Residential Loads	Conductor Size	Overcurrent Device
Sub Panel	#6 Copper 75º	60 AMP
Furnace	#6 Copper 75º	60 AMP
Furnace	#4 Copper 60º	60 AMP
Furnace, Range, Welder	#6 Copper 60º	50 AMP
Range, Welder	#8 Copper 75º	50 AMP
Range (per rating)	#8 Copper 60º	40 AMP
Cook Top, Dryer, Water Heater	#10 Copper 60º	30 AMP
Small Appliance, Laundry, Lighting	#12 Copper 60º	20 AMP
Lighting	#14 Copper 60º	15 AMP

➲ **NOTE:** 60º rated conductors within Romex cable. When a 75º rated SE cable is used, the terminations (breakers and outlets) shall be rated and listed for 75º usage.

Service Entrance and Feeder Conductors

1. Conductor sizes of services and sub-panels for residential dwellings (single set 3-wire, single phase only) - NEC - Notes to Table 310-16, #3.
2. Conductor sizes of services and sub-panels for residential accessory structures, non-residential, commercial and industrial buildings (conductor sizes in parentheses). NEC Table 310-16.

Table E-2: Conductor Sizes of Services		
Copper	**Aluminum**	**Service and Disconnect Rating**
#4 (#2)	#2 (#1/0)	100 AMPS
#2 (#1)	#1/0 (#2/0)	125 AMPS
#1 (#1/0)	#2/0 (#3/0)	150 AMPS
#1/0 (#2/0)	#3/0 (#4/0)	175 AMPS
#2/0 (#3/0)	#4/0 (250 kcmil)	200 AMPS

Required Circuits - NEC 210-52

1. Minimum two 20 AMP small appliance circuits for:
   a. Kitchen.
   b. Pantry.
   c. Dining room.
2. One 20 AMP laundry circuit for automatic washer only. A gas dryer may draw its power from a 15 or 20 amp combination load circuit.
3. One circuit for each major appliance or dedicated load, sized per name plate rating.
4. There shall be at least one 20 amp branch circuit for bathroom receptacle outlets. Such circuits shall have no other outlets.

➲ NOTE **Where the 20 amp circuit supplies a single bathroom only, outlets or other equipment within the same bathroom are permitted to be supplied on the circuit are exempt.**

5. Lighting circuits: Calculate 3 watts per square foot.

Baseboard or Fixed Electric Space Heating

1. Calculate a minimum of 10 watts per square foot.

➲ NOTE **For accurate heating requirements a heat loss calculation should be done for each dwelling.**

2. When installed as a conventional heating system the wiring shall be run to each room and habitable area of the dwelling. The heating units are not required to be installed for final inspection when used as a backup for wood stove or solar heat.
3. Load calculations may be required for 110 volt and 220 volt heating systems to determine the required circuits.

Receptacle Outlet Locations - NEC 210-52

1. In rooms, within 6' from doors or openings and 12'oc maximum, along walls.
2. In rooms, any space 24" and wider, along walls.
3. Kitchen countertop spaces: 12" and wider, ever 48"oc maximum or any portion more than 24". For island and peninsular countertop spaces, at least one receptacle outlet is required.
4. In each bathroom at the sink location, within 3' and accessible for each sink.
5. Laundry areas within 6' of the appliances.
6. Basements, garages, and exterior locations one minimum each area.
7. Hallways 10' or more in length one required.
8. Receptacles are not allowed over baseboard heaters.
9. Receptacle outlets shall not be installed in the face-up position on the work surfaces of countertops.

Switched Light Fixtures - Required Locations - NEC 210-70

Stairs, foyers, hallways, kitchens, bathrooms, attached garages, basements and outside at all exterior doors, shall be serviced by fixed overhead or wall hung lighting fixtures. Lighting fixtures for stairs shall be controlled by 3-way switches. Equipment in attics or crawl spaces shall have a light with a switch at the access.

Switched Receptacles For Lighting - NEC 210-70

Living, dining and family rooms, dens, studies, lofts and bedrooms shall be serviced by at least one switched receptacle for plug-in lighting fixtures (these locations may be serviced by fixed lighting fixtures).

Closet Lighting and Recessed Fixtures - NEC 410-8, 65 & 66

Incandescent light fixtures in closets shall have 12" horizontal clearance to the edge of the shelf, hanging or storage area. 6" horizontal clearance is allowed for recessed lighting and fluorescent fixtures. Recessed lighting fixture installations shall maintain 3" clearance to thermal insulation and½" to any combustible material. Incandescent recessed lighting fixtures (thermally protected), may be in direct contact with thermal insulation, and shall be so identified.

Ground Fault Circuit Interrupters (GFCI) - NEC 210-8

GFCI protection is required in the following locations:

1. Receptacles in bathrooms.
2. Receptacles within 6' of wet bar, laundry and utility sinks.
3. Receptacles in garages.

> **➲ NOTE** **Receptacles in garage for dedicated appliances and where not readily accessible are exempt.**

4. Outdoors.

> **➲ NOTE** **Receptacles that are not readily accessible and are supplied by a dedicated branch circuit for electric snow melting or deicing equipment are exempt.**

5. All receptacles that serve kitchen countertop surfaces.
6. All receptacles installed in crawl spaces and in unfinished basements.
7. Temporary service receptacles/construction power.

Arc-Fault Circuit Interrupter Protection

1. Definition: An arc-fault circuit-interrupter is a device intended to provide protection from the effects of arc faults by recognizing characteristics unique to arcing and by functioning to de-energize the circuit when an arc fault is detected.
2. Dwelling unit bedrooms: All branch circuits that supply 125-volt, single-phase, 15- and 20-ampere receptacle outlets installed in dwelling unit bedrooms shall be protected by an arc-fault circuit interrupter(s).

Wet and Damp Locations - NEC 410-4a

Any fixture or equipment located in wet or damp locations shall be approved for such location and shall be so marked.

Floor Receptacles - NEC 370-1b

Floor receptacles shall be installed with approved listed floor boxes and covers.

Bonding Other Enclosures - County Amendment

Whenever concentric or eccentric knockouts are encountered throughout a metallic electric raceway system, equipment grounding continuity shall be maintained by bonding bushing and jumpers.

Spas and Hot Tubs (Indoors Only) - NEC 680-41

1. Receptacles:
    a. One receptacle required, located a minimum of 5' away to a maximum of 10' away from the inside wall of a spa or hot tub
    b. Receptacles located within 10' of a spa or hot tub shall be protected by GFCI.
    c. Receptacles providing power to the spa or hot tub shall be protected by a GFCI.
2. Lighting fixtures:
    a. Lighting fixtures within 12' above and within 5' horizontally from the inside wall above the maximum water level of a spa or hot tub shall be protected by a GFCI.
    b. Lighting fixtures located over a spa or hot tub shall be a minimum of 7'6" above the maximum water level unless the fixture has a non-metallic body or is an electrically isolated metal lighting fixture with trim, the lens or globe is glass or plastic, it's suitable for damp locations and protected by a GFCI.
3. Wall switches - Wall switches shall be located at least 5' away from the inside wall of a spa or hot tub.
4. Underwater lighting fixtures, bonding, grounding and electric water heaters, shall comply with all provisions of the code.

Hydromassage Bathtub - NEC 680-70

Supplied by a GFCI protected circuit. The GFCI devise shall be motor rated (faceless GFCI) and it shall be readily accessible.

Electric Service and Temporary Electric Service Permits

1. Installations for electrical service shall comply with APS requirements and are inspected by Coconino County for conformance. When approved a green tag will be affixed to the service to designate service approved to connect, at the time of the final inspection.
2. Electric service permits and the approval of such equipment will not be allowed on vacant land with the exception of electrical equipment for the service of a well and in commercial zones when approved by the Building Official.
3. Electric services are only allowed to be placed on structures with a permanent foundation of an area 240 square feet or larger.
4. Electric services may be installed on approved power poles or pedestals for manufactured homes, modular homes, wells, and in commercial zones only.

    Upon approval of the Building Official and where deemed necessary due to site conditions, the main service for a single family dwelling may be mounted on a power pole or an electric service pedestal. A main disconnect is required on the house in a readily identifiable location in the same vicinity of the service entrance conductors.
5. Only one (1) electric service is allowed for any parcel of land zoned AR (Agricultural Residential), General (10 acre minimum parcel size), RS (Residential Single Family Dwelling), RR (Rural Residential) and PRD (Planned Residential Development), which are zones for Single Family Dwellings only.

    Upon approval of the Building Official and where deemed necessary due to site conditions, a second electric service may be authorized for an accessory structure in Agricultural Residential and General zones only.
6. Temporary power electric service permits are allowed in conjunction with building permits for new construction. These services shall supply a minimum load of at least one or more 15 or 20 amperes one 120 volt duplex receptacles that are GFCI protected for construction purposes. The services shall meet all installation requirements of the electric utility supplier. The electric service shall be rated 100 amperes minimum.

Electric Rough Inspection

1. Junction boxes shall be device ready.
2. All junction boxes shall be accessible.
3. Water and gas bond connection shall be accessible.

4. Electrical wiring shall be installed complete, stapled and in a workmanship like manner.
5. Metal boxes shall be bonded by a jumper from the device and/or the grounding conductor.
6. Nail plate wire protection - When holes in studs, joists or rafters are within 1¼" to the edge, nail plates shall be installed. Nail plates shall be 1/16" thick.
7. Cables run along studs, joists, and rafters, shall be installed and supported so that the nearest surface of the cables is not less than 1¼" from the edge of the framing member where nails or screws penetrate. Where it is impossible to maintain this 1¼", the cable shall be protected by a sleeve 1/16" thick.
8. Smoke detectors shall be powered by the house electric and inter-wired so all sound simultaneously. Smoke detectors shall have a built-in battery backup.
9. In areas of no commercial power, electric wiring for final shall be checked with a generator.

FLOOR JOISTS — 40# Live Load, 10# Dead Load, ℓ/360

Residential occupancies include private dwelling, private apartment and hotel guest rooms. Deck under CABO and Standard Codes.[1]

Table FJ-1

Species or Group	Grade	Span (feet and inches)											
		2 x 6			2 x 8			2 x 10			2 x 12		
		12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc
Douglas Fir-Larch	Sel. Struc.	11-4	10-4	9-0	15-0	13-7	11-11	19-1	17-4	15-2	23-3	21-1	18-5
	No. 1 & Btr.	11-2	10-2	8-10	14-8	13-4	11-8	18-9	17-0	14-5	22-10	20-5	16-8
	No. 1	10-11	9-11	8-8	14-5	13-1	11-0	18-5	16-5	13-5	22-0	19-1	15-7
	No. 2	10-9	9-9	8-1	14-2	12-7	10-3	17-9	15-5	12-7	20-7	17-10	14-7
	No. 3	8-8	7-6	6-2	11-0	9-6	7-9	13-5	11-8	9-6	15-7	13-6	11-0
Douglas Fir-South	Sel. Struc.	10-3	9-4	8-2	13-6	12-3	10-9	17-3	15-8	13-8	21-0	19-1	16-8
	No. 1	10-0	9-1	7-11	13-2	12-0	10-5	16-10	15-3	12-9	20-6	18-1	14-9
	No. 2	9-9	8-10	7-9	12-10	11-8	10-0	16-5	14-11	12-2	19-11	17-4	14-2
	No. 3	8-6	7-4	6-0	10-9	9-3	7-7	13-1	11-4	9-3	15-2	13-2	10-9
Hem-Fir	Sel. Struc.	10-9	9-9	8-6	14-2	12-10	11-3	18-0	16-5	14-4	21-11	19-11	17-5
	No. 1 & Btr.	10-6	9-6	8-4	13-10	12-7	11-0	17-8	16-0	13-9	21-6	19-6	16-0
	No. 1	10-6	9-6	8-4	13-10	12-7	10-9	17-8	16-0	13-1	21-6	18-7	15-2
	No. 2	10-0	9-1	7-11	13-2	12-0	10-2	16-10	15-2	12-5	20-4	17-7	14-4
	No. 3	8-8	7-6	6-2	11-0	9-6	7-9	13-5	11-8	9-6	15-7	13-6	11-0
Spruce-Pine-Fir (South)	Sel. Struc.	10-0	9-1	7-11	13-2	12-0	10-6	16-10	15-3	13-4	20-6	18-7	16-3
	No. 1	9-9	8-10	7-9	12-10	11-8	10-2	16-5	14-11	12-5	19-11	17-7	14-4
	No. 2	9-6	8-7	7-6	12-6	11-4	9-6	15-11	14-3	11-8	19-1	16-6	13-6
	No. 3	8-0	6-11	5-8	10-2	8-9	7-2	12-5	10-9	8-9	14-4	12-5	10-2
Western Woods	Sel. Struc.	9-9	8-10	7-9	12-10	11-8	10-2	16-5	14-11	12-7	19-11	17-10	14-7
	No. 1	9-6	8-7	7-0	12-6	10-10	8-10	15-4	13-3	10-10	17-9	15-5	12-7
	No. 2	9-2	8-4	7-0	12-1	10-10	8-10	15-4	13-3	10-10	17-9	15-5	12-7
	No. 3	7-6	6-6	5-4	9-6	8-3	6-9	11-8	10-1	8-3	13-6	11-8	9-6

DECKS

FLOOR JOISTS — 60# Live Load, 10# Dead Load, ℓ/360

Residential balconies (exterior) under CABO, BOCA and UBC. Decks under UBC and BOCA.[1]

Table FJ-7

Species or Group		Grade	Span (feet and inches)											
			2 x 8			2 x 10			2 x 12			2 x 14		
			12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc
Douglas Fir-Larch	2 x 6	Sel. Struc.	13-1	11-11	10-5	16-8	15-2	13-3	20-3	18-5	15-10	23-11	21-8	17-9
	12" 9'-4"	No. 1 & Btr.	12-10	11-8	10-0	16-5	14-11	12-2	19-11	17-3	14-1	22-4	19-4	15-9
	16" 7'-11"	No. 1	12-7	11-5	9-4	16-1	13-11	11-4	18-7	16-1	13-2	20-10	18-0	14-8
	24" 9'-4"	No. 2	12-4	10-8	8-8	15-0	13-0	10-7	17-5	15-1	12-4	19-5	16-10	13-9
		No. 3	9-4	8-1	6-7	11-4	9-10	8-0	13-2	11-5	9-4	14-8	12-9	10-5
Douglas Fir-South		Sel. Struc.	11-10	10-9	9-4	15-1	13-8	11-11	18-4	16-8	14-7	21-7	19-7	16-9
		No. 1	11-6	10-6	8-10	14-8	13-2	10-9	17-8	15-4	12-6	19-9	17-1	13-11
		No. 2	11-3	10-2	8-5	14-4	12-8	10-4	16-11	14-8	11-11	18-11	16-4	13-4
		No. 3	9-1	7-10	6-5	11-1	9-7	7-10	12-10	11-1	9-1	14-4	12-5	10-2
Hem-Fir		Sel. Struc.	12-4	11-3	9-10	15-9	14-4	12-6	19-2	17-5	15-2	22-7	20-6	17-5
		No. 1 & Btr.	12-1	11-0	9-6	15-5	14-0	11-8	18-9	16-6	13-6	21-4	18-5	15-1
		No. 1	12-1	11-0	9-1	15-5	13-7	11-1	18-2	15-9	12-10	20-3	17-7	14-4
		No. 2	11-6	10-6	8-7	14-8	12-10	10-6	17-2	14-10	12-2	19-2	16-7	13-7
		No. 3	9-4	8-1	6-7	11-4	9-10	8-0	13-2	11-5	9-4	14-8	12-9	10-5
Spruce-Pine-Fir (South)		Sel. Struc.	11-6	10-6	9-2	14-8	13-4	11-8	17-11	16-3	14-2	21-1	19-2	16-9
		No. 1	11-3	10-2	8-7	14-4	12-10	10-6	17-2	14-10	12-2	19-2	16-7	13-7
		No. 2	10-11	9-10	8-1	13-11	12-0	9-10	16-1	14-0	11-5	18-0	15-7	12-9
		No. 3	8-7	7-5	6-1	10-6	9-1	7-5	12-2	10-6	8-7	13-7	11-9	9-7
Western Woods		Sel. Struc.	11-3	10-2	8-8	14-4	13-0	10-7	17-5	15-1	12-4	19-5	16-10	13-9
		No. 1	10-7	9-2	7-6	12-11	11-3	9-2	15-0	13-0	10-7	16-9	14-6	11-10
		No. 2	10-7	9-2	7-6	12-11	11-3	9-2	15-0	13-0	10-7	16-9	14-6	11-10
		No. 3	8-1	7-0	5-8	9-10	8-6	6-11	11-5	9-10	8-1	12-9	11-0	9-0

[1] Deck spans are based on normal conditions of use and assume the moisture content of lumber used in decks will not be maintained at a moisture content in excess of 19% for an extended period of time.

CEILING JOISTS

10# Live Load, 5# Dead Load, ℓ/240

Table CJ-4

Use these loading conditions for the following: No attic storage.
Ceilings where the roof slope is not steeper than 3 in 12.
Drywall ceilings.

Species or Group	Grade	Span (feet and inches)											
		2 x 4			2 x 6			2 x 8			2 x 10		
		12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc
Douglas Fir-Larch	Sel. Struc.	13-2	11-11	10-5	20-8	18-9	16-4	27-2	24-8	21-7	34-8	31-6	27-6
	No. 1 & Btr.	12-11	11-9	10-3	20-3	18-5	16-1	26-9	24-3	21-2	34-1	31-0	26-4
	No. 1	12-8	11-6	10-0	19-11	18-1	15-9	26-2	23-10	20-1	33-5	30-0	24-6
	No. 2	12-5	11-3	9-10	19-6	17-8	14-10	25-8	23-0	18-9	32-5	28-1	22-11
	No. 3	10-10	9-5	7-8	15-10	13-9	11-2	20-1	17-5	14-2	24-6	21-3	17-4
Douglas Fir-South	Sel. Struc.	11-10	10-9	9-5	18-8	16-11	14-9	24-7	22-4	19-6	31-4	28-6	24-10
	No. 1	11-7	10-6	9-2	18-2	16-6	14-5	24-0	21-9	19-0	30-7	27-9	23-3
	No. 2	11-3	10-3	8-11	17-8	16-1	14-1	23-4	21-2	18-3	29-9	27-1	22-3
	No. 3	10-7	9-2	7-6	15-5	13-5	10-11	19-7	16-11	13-10	23-11	20-8	16-11
Hem-Fir	Sel. Struc.	12-5	11-3	9-10	19-6	17-8	15-6	25-8	23-4	20-5	32-9	29-9	26-0
	No. 1 & Btr.	12-2	11-0	9-8	19-1	17-4	15-2	25-2	22-10	19-11	32-1	29-2	25-2
	No. 1	12-2	11-0	9-8	19-1	17-4	15-2	25-2	22-10	19-7	32-1	29-2	23-11
	No. 2	11-7	10-6	9-2	18-2	16-6	14-5	24-0	21-9	18-6	30-7	27-8	22-7
	No. 3	10-10	9-5	7-8	15-10	13-9	11-2	20-1	17-5	14-2	24-6	21-3	17-4
Spruce-Pine-Fir (South)	Sel. Struc.	11-7	10-6	9-2	18-2	16-6	14-5	24-0	21-9	19-0	30-7	27-9	24-3
	No. 1	11-3	10-3	8-11	17-8	16-1	14-1	23-4	21-2	18-6	29-9	27-1	22-7
	No. 2	10-11	9-11	8-8	17-2	15-7	13-8	22-8	20-7	17-5	28-11	26-0	21-3
	No. 3	10-0	8-8	7-1	14-7	12-8	10-4	18-6	16-0	13-1	22-7	19-7	16-0
Western Woods	Sel. Struc.	11-3	10-3	8-11	17-8	16-1	14-1	23-4	21-2	18-6	29-9	27-1	22-11
	No. 1	10-11	9-11	8-8	17-2	15-7	12-9	22-8	19-10	16-2	28-0	24-3	19-9
	No. 2	10-7	9-8	8-5	16-8	15-2	12-9	21-11	19-10	16-2	28-0	24-3	19-9
	No. 3	9-5	8-2	6-8	13-9	11-11	9-8	17-5	15-1	12-4	21-3	18-5	15-0

CEILING JOISTS

10# Live Load, 10# Dead Load, ℓ/360

Table CJ-3

Use these loading conditions for the following: No attic storage.
Ceilings where the roof slope is not steeper than 3 in 12.
Plaster ceilings.

Species or Group	Grade	Span (feet and inches)											
		2 x 4			2 x 6			2 x 8			2 x 10		
		12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc
Douglas Fir-Larch	Sel. Struc.	11-6	10-5	9-1	18-0	16-4	14-4	23-9	21-7	18-10	30-4	27-6	24-1
	No. 1 & Btr.	11-3	10-3	8-11	17-8	16-1	14-1	23-4	21-2	18-6	29-9	27-1	22-9
	No. 1	11-1	10-0	8-9	17-4	15-9	13-9	22-11	20-10	17-5	29-2	26-0	21-3
	No. 2	10-10	9-10	8-7	17-0	15-6	12-10	22-5	19-11	16-3	28-1	24-4	19-10
	No. 3	9-5	8-2	6-8	13-9	11-11	9-8	17-5	15-1	12-4	21-3	18-5	15-0
Douglas Fir-South	Sel. Struc.	10-4	9-5	8-3	16-3	14-9	12-11	21-5	19-6	17-0	27-5	24-10	21-9
	No. 1	10-1	9-2	8-0	15-11	14-5	12-7	20-11	19-0	16-6	26-9	24-3	20-2
	No. 2	9-10	8-11	7-10	15-6	14-1	12-3	20-5	18-6	15-9	26-0	23-7	19-3
	No. 3	9-2	7-11	6-6	13-5	11-7	9-6	16-11	14-8	12-0	20-8	17-11	14-8
Hem-Fir	Sel. Struc.	10-10	9-10	8-7	17-0	15-6	13-6	22-5	20-5	17-10	28-7	26-0	22-9
	No. 1 & Btr.	10-7	9-8	8-5	16-8	15-2	13-3	21-11	19-11	17-5	28-0	25-5	21-9
	No. 1	10-7	9-8	8-5	16-8	15-2	13-3	21-11	19-11	16-11	28-0	25-4	20-8
	No. 2	10-1	9-2	8-0	15-11	14-5	12-7	20-11	19-0	16-0	26-9	24-0	19-7
	No. 3	9-5	8-2	6-8	13-9	11-11	9-8	17-5	15-1	12-4	21-3	18-5	15-0
Spruce-Pine-Fir (South)	Sel. Struc.	10-1	9-2	8-0	15-11	14-5	12-7	20-11	19-0	16-7	26-9	24-3	21-2
	No. 1	9-10	8-11	7-10	15-6	14-1	12-3	20-5	18-6	16-0	26-0	23-8	19-7
	No. 2	9-7	8-8	7-7	15-0	13-8	11-11	19-10	18-0	15-1	25-3	22-6	18-5
	No. 3	8-8	7-6	6-1	12-8	11-0	8-11	16-0	13-11	11-4	19-7	16-11	13-10
Western Woods	Sel. Struc.	9-10	8-11	7-10	15-6	14-1	12-3	20-5	18-6	16-2	26-0	23-8	19-10
	No. 1	9-7	8-8	7-7	15-0	13-7	11-1	19-10	17-2	14-0	24-3	21-0	17-1
	No. 2	9-3	8-5	7-4	14-7	13-3	11-1	19-2	17-2	14-0	24-3	21-0	17-1
	No. 3	8-2	7-0	5-9	11-11	10-4	8-5	15-1	13-0	10-8	18-5	15-11	13-0

ROOF RAFTERS

30# Snow Load, 10# Dead Load, ℓ/240

Table RR-10

Roof slope 3 in 12 or less.
Light roof covering.
No ceiling finish.

Species or Group	Grade	Span (feet and inches)											
		2 x 6			2 x 8			2 x 10			2 x 12		
		12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc
Douglas Fir-Larch	Sel. Struc.	14-4	13-0	11-4	18-10	17-2	15-0	24-1	21-10	19-1	29-3	26-7	22-6
	No. 1 & Btr.	14-1	12-9	11-2	18-6	16-10	14-2	23-8	21-2	17-3	28-4	24-6	20-0
	No. 1	13-9	12-6	10-5	18-2	16-2	13-2	22-9	19-9	16-1	26-5	22-10	18-8
	No. 2	13-6	11-11	9-9	17-5	15-1	12-4	21-4	18-5	15-1	24-8	21-5	17-6
	No. 3	10-5	9-0	7-4	13-2	11-5	9-4	16-1	13-11	11-5	18-8	16-2	13-2
Douglas Fir-South	Sel. Struc.	12-11	11-9	10-3	17-0	15-6	13-6	21-9	19-9	17-3	26-5	24-0	21-0
	No. 1	12-7	11-5	9-10	16-7	15-1	12-6	21-2	18-9	15-3	25-1	21-8	17-9
	No. 2	12-3	11-2	9-5	16-2	14-8	12-0	20-8	17-11	14-8	24-0	20-9	17-0
	No. 3	10-2	8-9	7-2	12-10	11-2	9-1	15-8	13-7	11-1	18-2	15-9	12-10
Hem-Fir	Sel. Struc.	13-6	12-3	10-9	17-10	16-2	14-2	22-9	20-8	18-0	27-8	25-1	21-11
	No. 1 & Btr.	13-3	12-0	10-6	17-5	15-10	13-6	22-3	20-2	16-6	27-1	23-5	19-2
	No. 1	13-3	12-0	10-2	17-5	15-9	12-10	22-2	19-3	15-8	25-9	22-3	18-2
	No. 2	12-7	11-5	9-7	16-7	14-11	12-2	21-0	18-2	14-10	24-4	21-1	17-3
	No. 3	10-5	9-0	7-4	13-2	11-5	9-4	16-1	13-11	11-5	18-8	16-2	13-2
Spruce-Pine-Fir (South)	Sel. Struc.	12-7	11-5	10-0	16-7	15-1	13-2	21-2	19-3	16-10	25-9	23-5	20-6
	No. 1	12-3	11-2	9-7	16-2	14-8	12-2	20-8	18-2	14-10	24-4	21-1	17-3
	No. 2	11-11	10-10	9-0	15-9	14-0	11-5	19-9	17-1	13-11	22-10	19-10	16-2
	No. 3	9-7	8-4	6-9	12-2	10-6	8-7	14-10	12-10	10-6	17-3	14-11	12-2
Western Woods	Sel. Struc.	12-3	11-2	9-9	16-2	14-8	12-4	20-8	18-5	15-1	24-8	21-5	17-6
	No. 1	11-10	10-3	8-5	15-0	13-0	10-8	18-4	15-11	13-0	21-3	18-5	15-1
	No. 2	11-7	10-3	8-5	15-0	13-0	10-8	18-4	15-11	13-0	21-3	18-5	15-1
	No. 3	9-0	7-10	6-4	11-5	9-11	8-1	13-11	12-1	9-10	16-2	14-0	11-5

ROOF RAFTERS

40# Snow Load, 10# Dead Load, ℓ/240

Table RR-11

Roof slope 3 in 12 or less.
Light roof covering.
No ceiling finish.

Species or Group	Grade	Span (feet and inches)											
		2 x 6			2 x 8			2 x 10			2 x 12		
		12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc
Douglas Fir-Larch	Sel. Struc.	13-0	11-10	10-4	17-2	15-7	13-7	21-10	19-10	17-4	26-7	24-2	20-1
	No. 1 & Btr.	12-9	11-7	10-0	16-10	15-3	12-8	21-6	18-11	15-5	25-4	21-11	17-11
	No. 1	12-6	11-5	9-4	16-6	14-5	11-9	20-4	17-8	14-5	23-7	20-5	16-8
	No. 2	12-3	10-8	8-9	15-7	13-6	11-0	19-1	16-6	13-6	22-1	19-2	15-7
	No. 3	9-4	8-1	6-7	11-9	10-3	8-4	14-5	12-6	10-2	16-8	14-6	11-10
Douglas Fir-South	Sel. Struc.	11-9	10-8	9-4	15-6	14-1	12-3	19-9	17-11	15-8	24-0	21-10	19-1
	No. 1	11-5	10-5	8-10	15-1	13-8	11-2	19-3	16-9	13-8	22-5	19-5	15-10
	No. 2	11-2	10-2	8-5	14-8	13-1	10-9	18-6	16-0	13-1	21-5	18-7	15-2
	No. 3	9-1	7-10	6-5	11-6	9-11	8-2	14-0	12-2	9-11	16-3	14-1	11-6
Hem-Fir	Sel. Struc.	12-3	11-2	9-9	16-2	14-8	12-10	20-8	18-9	16-5	25-1	22-10	19-9
	No. 1 & Btr.	12-0	10-11	9-6	15-10	14-5	12-1	20-2	18-1	14-9	24-2	21-0	17-1
	No. 1	12-0	10-11	9-1	15-10	14-1	11-6	19-10	17-2	14-0	23-0	19-11	16-3
	No. 2	11-5	10-5	8-7	15-1	13-4	10-10	18-9	16-3	13-3	21-9	18-10	15-5
	No. 3	9-4	8-1	6-7	11-9	10-3	8-4	14-5	12-6	10-2	16-8	14-6	11-10
Spruce-Pine-Fir (South)	Sel. Struc.	11-5	10-5	9-1	15-1	13-9	12-0	19-3	17-6	15-3	23-5	21-3	18-7
	No. 1	11-2	10-2	8-7	14-8	13-4	10-10	18-9	16-3	13-3	21-9	18-10	15-5
	No. 2	10-10	9-10	8-1	14-3	12-6	10-3	17-8	15-3	12-6	20-5	17-9	14-6
	No. 3	8-7	7-5	6-1	10-10	9-5	7-8	13-3	11-6	9-5	15-5	13-4	10-11
Western Woods	Sel. Struc.	11-2	10-2	8-9	14-8	13-4	11-0	18-9	16-6	13-6	22-1	19-2	15-7
	No. 1	10-7	9-2	7-6	13-5	11-8	9-6	16-5	14-3	11-7	19-1	16-6	13-6
	No. 2	10-6	9-2	7-6	13-5	11-8	9-6	16-5	14-3	11-7	19-1	16-6	13-6
	No. 3	8-1	7-0	5-8	10-3	8-10	7-3	12-6	10-10	8-10	14-6	12-6	10-3

ROOF RAFTERS

30# Snow Load, 7# Dead Load, ℓ/180

Roof slope greater than 3 in 12.
Light roof covering.
No ceiling finish.

Table RR-15

Species or Group	Grade	Span (feet and inches)											
		2×6			2×8			2×10			2×12		
		12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc
Douglas Fir-Larch	Sel. Struc.	15-9	14-4	12-6	20-9	18-10	16-6	26-6	24-1	20-2	32-2	28-8	23-5
	No. 1 & Btr.	15-6	14-1	11-7	20-5	18-0	14-8	25-5	22-0	17-11	29-5	25-6	20-10
	No. 1	15-2	13-3	10-10	19-5	16-9	13-8	23-8	20-6	16-9	27-5	23-9	19-5
	No. 2	14-4	12-5	10-1	18-2	15-8	12-10	22-2	19-2	15-8	25-8	22-3	18-2
	No. 3	10-10	9-4	7-8	13-8	11-10	9-8	16-9	14-6	11-10	19-5	16-10	13-9
Douglas Fir-South	Sel. Struc.	14-3	12-11	11-3	18-9	17-0	14-11	23-11	21-9	19-0	29-1	26-5	22-2
	No. 1	13-10	12-7	10-3	18-3	15-11	13-0	22-6	19-5	15-11	26-1	22-7	18-5
	No. 2	13-6	12-0	9-10	17-7	15-3	12-5	21-6	18-8	15-2	24-11	21-7	17-8
	No. 3	10-7	9-2	7-6	13-4	11-7	9-5	16-4	14-2	11-6	18-11	16-5	13-5
Hem-Fir	Sel. Struc.	14-10	13-6	11-10	19-7	17-10	15-7	25-0	22-9	19-10	30-5	27-8	23-0
	No. 1 & Btr.	14-7	13-3	11-1	19-2	17-2	14-1	24-3	21-0	17-2	28-2	24-4	19-11
	No. 1	14-7	12-11	10-7	18-11	16-4	13-4	23-1	20-0	16-4	26-9	23-2	18-11
	No. 2	13-10	12-3	10-0	17-10	15-6	12-8	21-10	18-11	15-5	25-4	21-11	17-11
	No. 3	10-10	9-4	7-8	13-8	11-10	9-8	16-9	14-6	11-10	19-5	16-10	13-9
Spruce-Pine-Fir (South)	Sel. Struc.	13-10	12-7	11-0	18-3	16-7	14-6	23-4	21-2	18-6	28-5	25-9	22-2
	No. 1	13-6	12-3	10-0	17-10	15-6	12-8	21-10	18-11	15-5	25-4	21-11	17-11
	No. 2	13-1	11-6	9-4	16-9	14-6	11-10	20-6	17-9	14-6	23-9	20-7	16-10
	No. 3	10-0	8-8	7-1	12-8	10-11	8-11	15-5	13-4	10-11	17-11	15-6	12-8
Western Woods	Sel. Struc.	13-6	12-3	10-1	17-10	15-8	12-10	22-2	19-2	15-8	25-8	22-3	18-2
	No. 1	12-4	10-8	8-9	15-8	13-6	11-1	19-1	16-6	13-6	22-2	19-2	15-8
	No. 2	12-4	10-8	8-9	15-8	13-6	11-1	19-1	16-6	13-6	22-2	19-2	15-8
	No. 3	9-4	8-1	6-8	11-10	10-3	8-5	14-6	12-7	10-3	16-10	14-7	11-11

ROOF RAFTERS

40# Snow Load, 7# Dead Load, ℓ/180

Roof slope greater than 3 in 12.
Light roof covering.
No ceiling finish.

Table RR-16

Species or Group	Grade	Span (feet and inches)											
		2×6			2×8			2×10			2×12		
		12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc
Douglas Fir-Larch	Sel. Struc.	14-4	13-0	11-4	18-10	17-2	14-8	24-1	21-10	17-11	29-3	25-5	20-9
	No. 1 & Btr.	14-1	12-7	10-4	18-5	16-0	13-1	22-6	19-6	15-11	26-2	22-8	18-6
	No. 1	13-7	11-9	9-7	17-2	14-11	12-2	21-0	18-2	14-10	24-4	21-1	17-3
	No. 2	12-8	11-0	9-0	16-1	13-11	11-5	19-8	17-0	13-11	22-9	19-9	16-1
	No. 3	9-7	8-4	6-9	12-2	10-6	8-7	14-10	12-10	10-6	17-3	14-11	12-2
Douglas Fir-South	Sel. Struc.	12-11	11-9	10-3	17-0	15-6	13-6	21-9	19-9	16-11	26-5	24-0	19-8
	No. 1	12-7	11-2	9-1	16-4	14-2	11-6	19-11	17-3	14-1	23-1	20-0	16-4
	No. 2	12-3	10-8	8-9	15-7	13-6	11-1	19-1	16-6	13-6	22-2	19-2	15-8
	No. 3	9-4	8-1	6-7	11-10	10-3	8-5	14-6	12-6	10-3	16-9	14-6	11-10
Hem-Fir	Sel. Struc.	13-6	12-3	10-9	17-10	16-2	14-2	22-9	20-8	17-7	27-8	25-0	20-5
	No. 1 & Btr.	13-3	12-0	9-10	17-5	15-3	12-6	21-6	18-8	15-3	25-0	21-7	17-8
	No. 1	13-3	11-6	9-4	16-9	14-6	11-10	20-6	17-9	14-6	23-9	20-7	16-9
	No. 2	12-6	10-10	8-10	15-10	13-9	11-3	19-4	16-9	13-8	22-6	19-5	15-11
	No. 3	9-7	8-4	6-9	12-2	10-6	8-7	14-10	12-10	10-6	17-3	14-11	12-2
Spruce-Pine-Fir (South)	Sel. Struc.	12-7	11-5	10-0	16-7	15-1	13-2	21-2	19-3	16-10	25-9	23-5	19-8
	No. 1	12-3	10-10	8-10	15-10	13-9	11-3	19-4	16-9	13-8	22-6	19-5	15-11
	No. 2	11-9	10-2	8-4	14-11	12-11	10-6	18-2	15-9	12-10	21-1	18-3	14-11
	No. 3	8-10	7-8	6-3	11-3	9-9	7-11	13-8	11-10	9-8	15-11	13-9	11-3
Western Woods	Sel. Struc.	12-3	11-0	9-0	16-1	13-11	11-5	19-8	17-0	13-11	22-9	19-9	16-1
	No. 1	10-11	9-6	7-9	13-10	12-0	9-10	16-11	14-8	12-0	19-8	17-0	13-11
	No. 2	10-11	9-6	7-9	13-10	12-0	9-10	16-11	14-8	12-0	19-8	17-0	13-11
	No. 3	8-4	7-2	5-11	10-6	9-1	7-5	12-10	11-2	9-1	14-11	12-11	10-7

ROOF RAFTERS

30# Snow Load, 15# Dead Load, ℓ/180

Table RR-22

Roof slope greater than 3 in 12.
Heavy roof covering.
No ceiling finish.

Species or Group	Grade	Span (feet and inches)											
		2 × 6			2 × 8			2 × 10			2 × 12		
		12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc
Douglas Fir-Larch	Sel. Struc.	15-9	14-4	11-10	20-9	18-4	15-0	25-10	22-5	18-3	30-0	26-0	21-2
	No. 1 & Btr.	14-11	12-11	10-6	18-10	16-4	13-4	23-0	19-11	16-3	26-8	23-1	18-11
	No. 1	13-11	12-0	9-10	17-7	15-3	12-5	21-6	18-7	15-2	24-11	21-7	17-7
	No. 2	13-0	11-3	9-2	16-5	14-3	11-8	20-1	17-5	14-2	23-3	20-2	16-6
	No. 3	9-10	8-6	6-11	12-5	10-9	8-9	15-2	13-2	10-9	17-7	15-3	12-5
Douglas Fir-South	Sel. Struc.	14-3	12-11	11-2	18-9	17-0	14-2	23-11	21-2	17-4	28-5	24-7	20-1
	No. 1	13-2	11-5	9-4	16-8	14-5	11-9	20-4	17-8	14-5	23-7	20-5	16-8
	No. 2	12-7	10-11	8-11	16-0	13-10	11-3	19-6	16-11	13-9	22-7	19-7	16-0
	No. 3	9-7	8-3	6-9	12-1	10-6	8-7	14-10	12-10	10-6	17-2	14-10	12-2
Hem-Fir	Sel. Struc.	14-10	13-6	11-7	19-7	17-10	14-8	25-0	22-0	18-0	29-6	25-6	20-10
	No. 1 & Btr.	14-3	12-4	10-1	18-0	15-7	12-9	22-0	19-1	15-7	25-6	22-1	18-0
	No. 1	13-6	11-9	9-7	17-2	14-10	12-1	20-11	18-1	14-10	24-3	21-0	17-2
	No. 2	12-10	11-1	9-1	16-2	14-0	11-6	19-10	17-2	14-0	22-11	19-11	16-3
	No. 3	9-10	8-6	6-11	12-5	10-9	8-9	15-2	13-2	10-9	17-7	15-3	12-5
Spruce-Pine-Fir (South)	Sel. Struc.	13-10	12-7	11-0	18-3	16-7	14-2	23-4	21-2	17-4	28-5	24-7	20-1
	No. 1	12-10	11-1	9-1	16-2	14-0	11-6	19-10	17-2	14-0	22-11	19-11	16-3
	No. 2	12-0	10-5	8-6	15-3	13-2	10-9	18-7	16-1	13-2	21-7	18-8	15-3
	No. 3	9-1	7-10	6-5	11-6	9-11	8-1	14-0	12-1	9-11	16-3	14-1	11-6
Western Woods	Sel. Struc.	13-0	11-3	9-2	16-5	14-3	11-8	20-1	17-5	14-2	23-3	20-2	16-6
	No. 1	11-2	9-8	7-11	14-2	12-3	10-0	17-4	15-0	12-3	20-1	17-5	14-2
	No. 2	11-2	9-8	7-11	14-2	12-3	10-0	17-4	15-0	12-3	20-1	17-5	14-2
	No. 3	8-6	7-4	6-0	10-9	9-4	7-7	13-2	11-5	9-4	15-3	13-2	10-9

ROOF RAFTERS

40# Snow Load, 15# Dead Load, ℓ/180

Table RR-23

Roof slope greater than 3 in 12.
Heavy roof covering.
No ceiling finish.

Species or Group	Grade	Span (feet and inches)											
		2 × 6			2 × 8			2 × 10			2 × 12		
		12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc
Douglas Fir-Larch	Sel. Struc.	14-4	13-0	10-8	18-10	16-7	13-6	23-5	20-3	16-6	27-1	23-6	19-2
	No. 1 & Btr.	13-6	11-8	9-6	17-1	14-9	12-1	20-10	18-0	14-9	24-2	20-11	17-1
	No. 1	12-7	10-10	8-11	15-11	13-9	11-3	19-5	16-10	13-9	22-6	19-6	15-11
	No. 2	11-9	10-2	8-4	14-10	12-11	10-6	18-2	15-9	12-10	21-1	18-3	14-11
	No. 3	8-11	7-8	6-3	11-3	9-9	7-11	13-9	11-11	9-9	15-11	13-9	11-3
Douglas Fir-South	Sel. Struc.	12-11	11-9	10-1	17-0	15-6	12-10	21-9	19-2	15-8	25-8	22-3	18-2
	No. 1	11-11	10-4	8-5	15-1	13-1	10-8	18-5	15-11	13-0	21-4	18-6	15-1
	No. 2	11-5	9-10	8-1	14-5	12-6	10-3	17-8	15-3	12-6	20-5	17-9	14-6
	No. 3	8-8	7-6	6-1	10-11	9-6	7-9	13-5	11-7	9-6	15-6	13-5	11-0
Hem-Fir	Sel. Struc.	13-6	12-3	10-6	17-10	16-2	13-4	22-9	19-11	16-3	26-8	23-1	18-10
	No. 1 & Btr.	12-10	11-2	9-1	16-3	14-1	11-6	19-11	17-3	14-1	23-1	20-0	16-4
	No. 1	12-3	10-7	8-8	15-6	13-5	10-11	18-11	16-5	13-5	21-11	19-0	15-6
	No. 2	11-7	10-0	8-2	14-8	12-8	10-4	17-11	15-6	12-8	20-9	18-0	14-8
	No. 3	8-11	7-8	6-3	11-3	9-9	7-11	13-9	11-11	9-9	15-11	13-9	11-3
Spruce-Pine-Fir (South)	Sel. Struc.	12-7	11-5	10-0	16-7	15-1	12-10	21-2	19-2	15-8	25-8	22-3	18-2
	No. 1	11-7	10-0	8-2	14-8	12-8	10-4	17-11	15-6	12-8	20-9	18-0	14-8
	No. 2	10-10	9-5	7-8	13-9	11-11	9-9	16-10	14-7	11-11	19-6	16-11	13-9
	No. 3	8-2	7-1	5-9	10-4	9-0	7-4	12-8	11-0	8-11	14-8	12-9	10-5
Western Woods	Sel. Struc.	11-9	10-2	8-4	14-10	12-11	10-6	18-2	15-9	12-10	21-1	18-3	14-11
	No. 1	10-1	8-9	7-2	12-10	11-1	9-1	15-8	13-7	11-1	18-2	15-9	12-10
	No. 2	10-1	8-9	7-2	12-10	11-1	9-1	15-8	13-7	11-1	18-2	15-9	12-10
	No. 3	7-8	6-8	5-5	9-9	8-5	6-11	11-11	10-4	8-5	13-9	11-11	9-9

ROOF RAFTERS

30# Snow Load, 15# Dead Load, ℓ/240

Table RR-29

Flat roof or cathedral ceiling with drywall finish.
Light roof covering.

Species or Group	Grade	Span (feet and inches)											
		2 x 6			2 x 8			2 x 10			2 x 12		
		12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc
Douglas Fir-Larch	Sel. Struc.	14-4	13-0	11-4	18-10	17-2	15-0	24-1	21-10	18-3	29-3	26-0	21-2
	No. 1 & Btr.	14-1	12-9	10-6	18-6	16-4	13-4	23-0	19-11	16-3	26-8	23-1	18-11
	No. 1	13-9	12-0	9-10	17-7	15-3	12-5	21-6	18-7	15-2	24-11	21-7	17-7
	No. 2	13-0	11-3	9-2	16-5	14-3	11-8	20-1	17-5	14-2	23-3	20-2	16-6
	No. 3	9-10	8-6	6-11	12-5	10-9	8-9	15-2	13-2	10-9	17-7	15-3	12-5
Douglas Fir-South	Sel. Struc.	12-11	11-9	10-3	17-0	15-6	13-6	21-9	19-9	17-3	26-5	24-0	20-1
	No. 1	12-7	11-5	9-4	16-7	14-5	11-9	20-4	17-8	14-5	23-7	20-5	16-8
	No. 2	12-3	10-11	8-11	16-0	13-10	11-3	19-6	16-11	13-9	22-7	19-7	16-0
	No. 3	9-7	8-3	6-9	12-1	10-6	8-7	14-10	12-10	10-6	17-2	14-10	12-2
Hem-Fir	Sel. Struc.	13-6	12-3	10-9	17-10	16-2	14-2	22-9	20-8	18-0	27-8	25-1	20-10
	No. 1 & Btr.	13-3	12-0	10-1	17-5	15-7	12-9	22-0	19-1	15-7	25-6	22-1	18-0
	No. 1	13-3	11-9	9-7	17-2	14-10	12-1	20-11	18-1	14-10	24-3	21-0	17-2
	No. 2	12-7	11-1	9-1	16-2	14-0	11-6	19-10	17-2	14-0	22-11	19-11	16-3
	No. 3	9-10	8-6	6-11	12-5	10-9	8-9	15-2	13-2	10-9	17-7	15-3	12-5
Spruce-Pine-Fir (South)	Sel. Struc.	12-7	11-5	10-0	16-7	15-1	13-2	21-2	19-3	16-10	25-9	23-5	20-1
	No. 1	12-3	11-1	9-1	16-2	14-0	11-6	19-10	17-2	14-0	22-11	19-11	16-3
	No. 2	11-11	10-5	8-6	15-3	13-2	10-9	18-7	16-1	13-2	21-7	18-8	15-3
	No. 3	9-1	7-10	6-5	11-6	9-11	8-1	14-0	12-1	9-11	16-3	14-1	11-6
Western Woods	Sel. Struc.	12-3	11-2	9-2	16-2	14-3	11-8	20-1	17-5	14-2	23-3	20-2	16-6
	No. 1	11-2	9-8	7-11	14-2	12-3	10-0	17-4	15-0	12-3	20-1	17-5	14-2
	No. 2	11-2	9-8	7-11	14-2	12-3	10-0	17-4	15-0	12-3	20-1	17-5	14-2
	No. 3	8-6	7-4	6-0	10-9	9-4	7-7	13-2	11-5	9-4	15-3	13-2	10-9

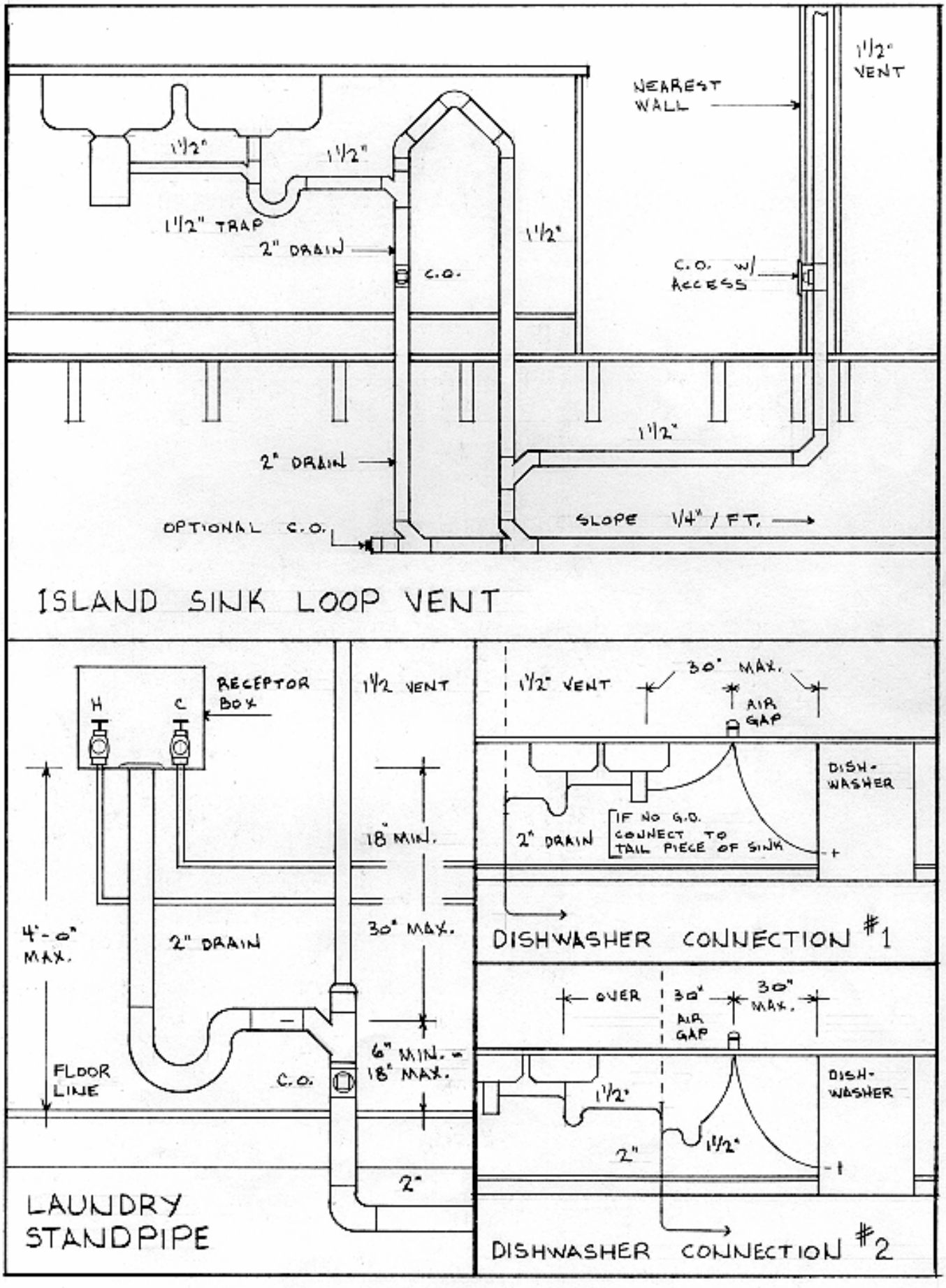
ROOF RAFTERS —

40# Snow Load, 15# Dead Load, ℓ/240

Table RR-30

Flat roof or cathedral ceiling with drywall finish.
Light roof covering.

Species or Group	Grade	Span (feet and inches)											
		2 x 6			2 x 8			2 x 10			2 x 12		
		12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc
Douglas Fir-Larch	Sel. Struc.	13-0	11-10	10-4	17-2	15-7	13-6	21-10	19-10	16-6	26-7	23-6	19-2
	No. 1 & Btr.	12-9	11-7	9-6	16-10	14-9	12-1	20-10	18-0	14-9	24-2	20-11	17-1
	No. 1	12-6	10-10	8-11	15-11	13-9	11-3	19-5	16-10	13-9	22-6	19-6	15-11
	No. 2	11-9	10-2	8-4	14-10	12-11	10-6	18-2	15-9	12-10	21-1	18-3	14-11
	No. 3	8-11	7-8	6-3	11-3	9-9	7-11	13-9	11-11	9-9	15-11	13-9	11-3
Douglas Fir-South	Sel. Struc.	11-9	10-8	9-4	15-6	14-1	12-3	19-9	17-11	15-8	24-0	21-10	18-2
	No. 1	11-5	10-4	8-5	15-1	13-1	10-8	18-5	15-11	13-0	21-4	18-6	15-1
	No. 2	11-2	9-10	8-1	14-5	12-6	10-3	17-8	15-3	12-6	20-5	17-9	14-6
	No. 3	8-8	7-6	6-1	10-11	9-6	7-9	13-5	11-7	9-6	15-6	13-5	11-0
Hem-Fir	Sel. Struc.	12-3	11-2	9-9	16-2	14-8	12-10	20-8	18-9	16-3	25-1	22-10	18-10
	No. 1 & Btr.	12-0	10-11	9-1	15-10	14-1	11-6	19-11	17-3	14-1	23-1	20-0	16-4
	No. 1	12-0	10-7	8-8	15-6	13-5	10-11	18-11	16-5	13-5	21-11	19-0	15-6
	No. 2	11-5	10-0	8-2	14-8	12-8	10-4	17-11	15-6	12-8	20-9	18-0	14-8
	No. 3	8-11	7-8	6-3	11-3	9-9	7-11	13-9	11-11	9-9	15-11	13-9	11-3
Spruce-Pine-Fir (South)	Sel. Struc.	11-5	10-5	9-1	15-1	13-9	12-0	19-3	17-6	15-3	23-5	21-3	18-2
	No. 1	11-2	10-0	8-2	14-8	12-8	10-4	17-11	15-6	12-8	20-9	18-0	14-8
	No. 2	10-10	9-5	7-8	13-9	11-11	9-9	16-10	14-7	11-11	19-6	16-11	13-9
	No. 3	8-2	7-1	5-9	10-4	9-0	7-4	12-8	11-0	8-11	14-8	12-9	10-5
Western Woods	Sel. Struc.	11-2	10-2	8-4	14-8	12-11	10-6	18-2	15-9	12-10	21-1	18-3	14-11
	No. 1	10-1	8-9	7-2	12-10	11-1	9-1	15-8	13-7	11-1	18-2	15-9	12-10
	No. 2	10-1	8-9	7-2	12-10	11-1	9-1	15-8	13-7	11-1	18-2	15-9	12-10
	No. 3	7-8	6-8	5-5	9-9	8-5	6-11	11-11	10-4	8-5	13-9	11-11	9-9


1½" VENT
NEAREST WALL
1½"
1½"
1½" TRAP
2" DRAIN
C.O.
1½"
C.O. w/ ACCESS
1½"
2" DRAIN
OPTIONAL C.O.
SLOPE 1/4" / FT.
ISLAND SINK LOOP VENT
RECEPTOR BOX
H
C
1½ VENT
18" MIN.
30" MAX.
4'-0" MAX.
2" DRAIN
FLOOR LINE
C.O.
6" MIN. - 18" MAX.
2"
LAUNDRY STANDPIPE
1½" VENT
30" MAX.
AIR GAP
DISH-WASHER
2" DRAIN
IF NO G.D. CONNECT TO TAIL PIECE OF SINK
DISHWASHER CONNECTION #1
OVER
30"
AIR GAP
30" MAX.
DISH-WASHER
1½"
2"
1½"
DISHWASHER CONNECTION #2

FOUNDATION VENTS
1 sq. ft. of venting per 150 sq. ft. of crawl area. 1/4" corrosion resistant mesh

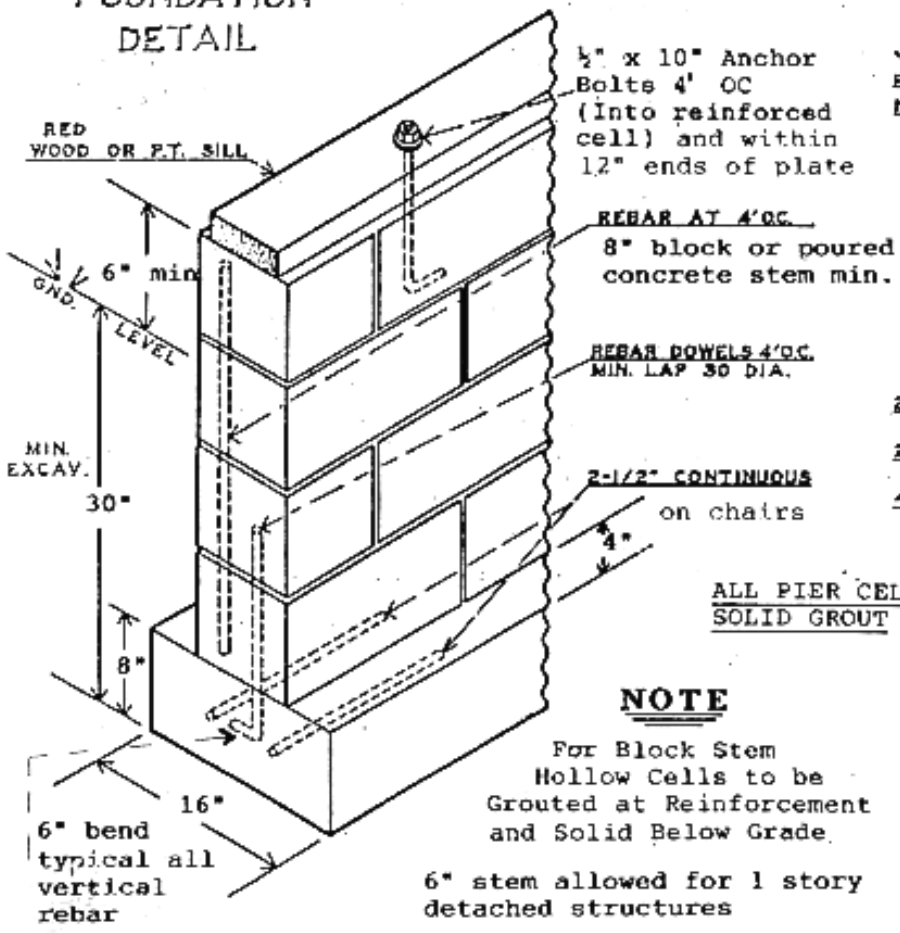
CRAWL ACCESS OPENING
18" x 24" minimum with a door

BEAM POCKET
The cell grouted solid with rebar girder to bear on pressure treated wood
1/2" Air space around girder

UNDER FLOOR CLEARANCES
18" minimum from grade to bottom of floor joists

12" minimum from grade to bottom of girder

FOUNDATION DETAIL



ALL PIER CELLS SOLID GROUT

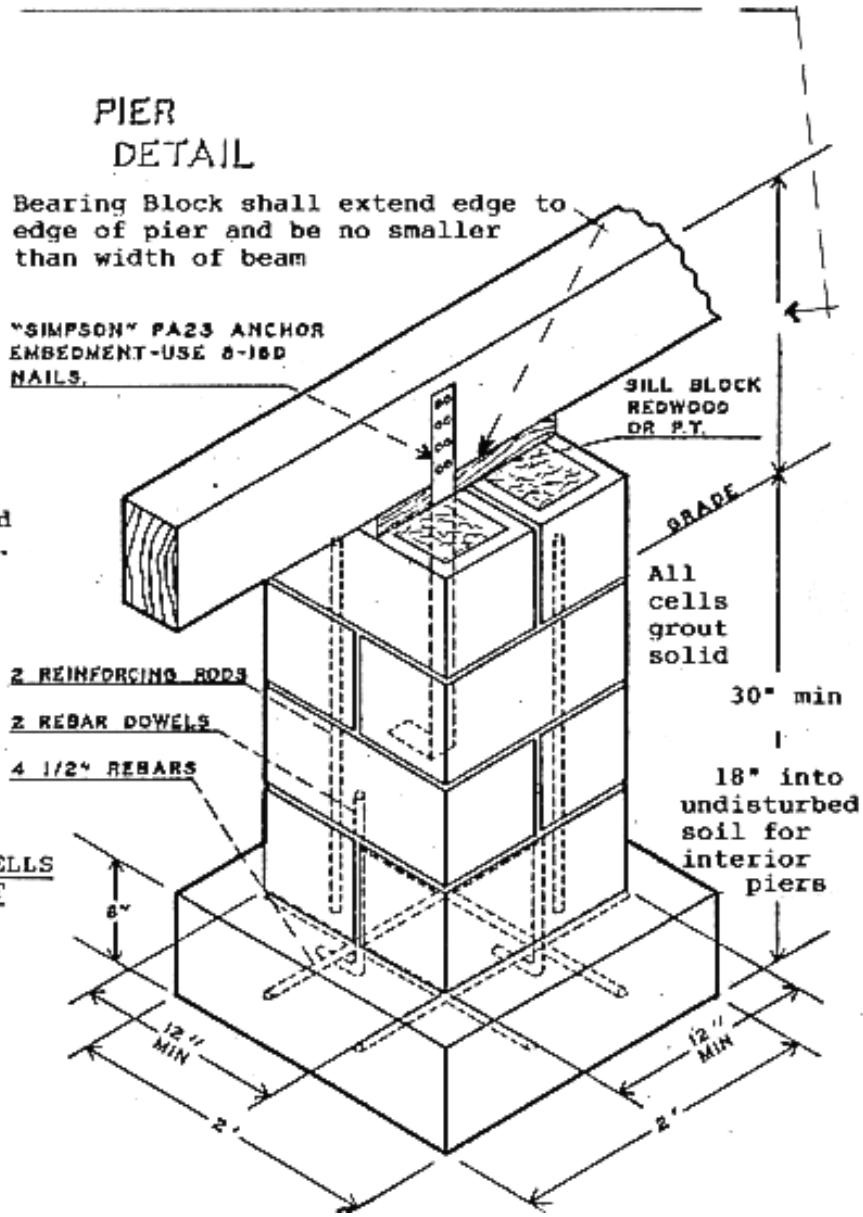
NOTE

For Block Stem Hollow Cells to be Grouted at Reinforcement and Solid Below Grade

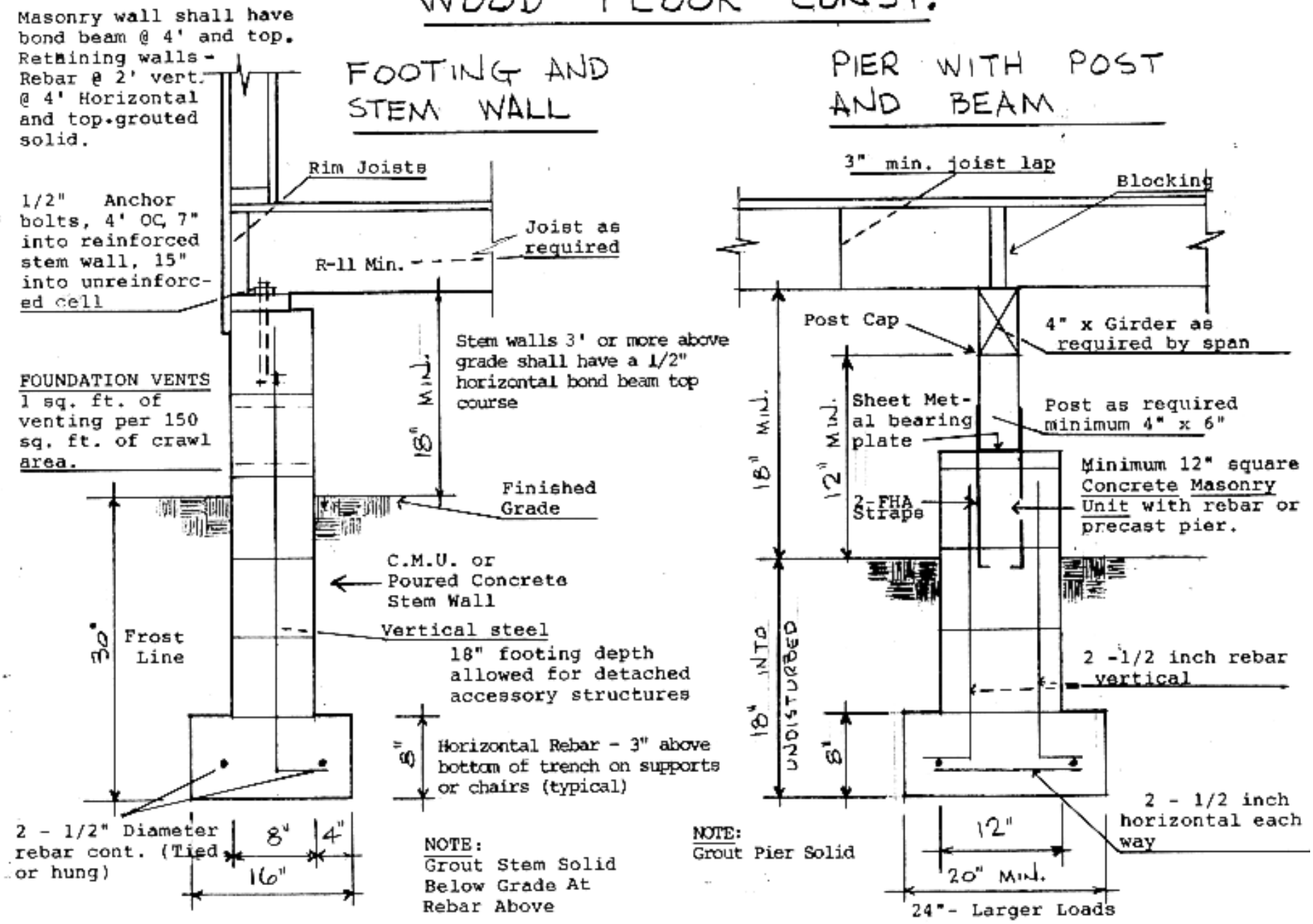
6" stem allowed for 1 story detached structures

PIER DETAIL

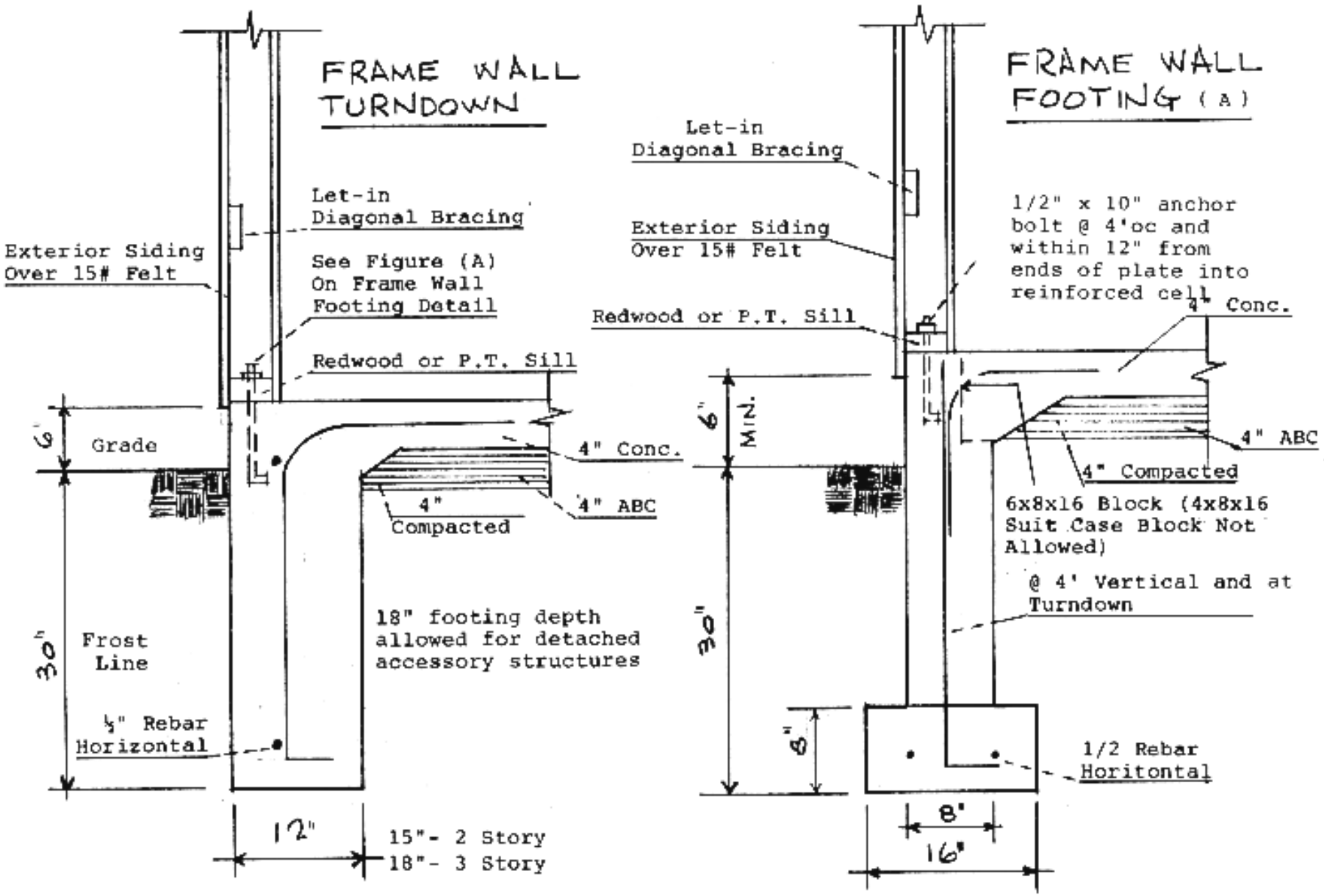
Bearing Block shall extend edge to edge of pier and be no smaller than width of beam

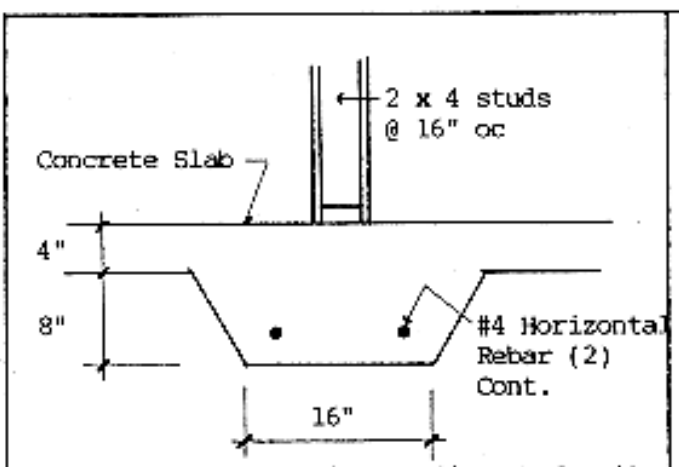


WOOD FLOOR CONST.

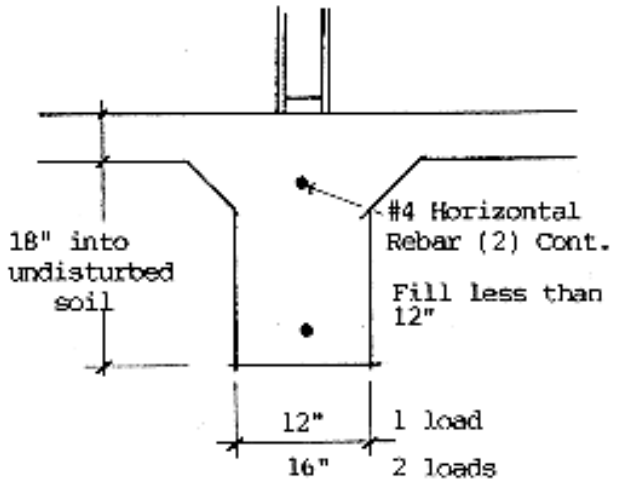


CONC. SLAB FLOOR

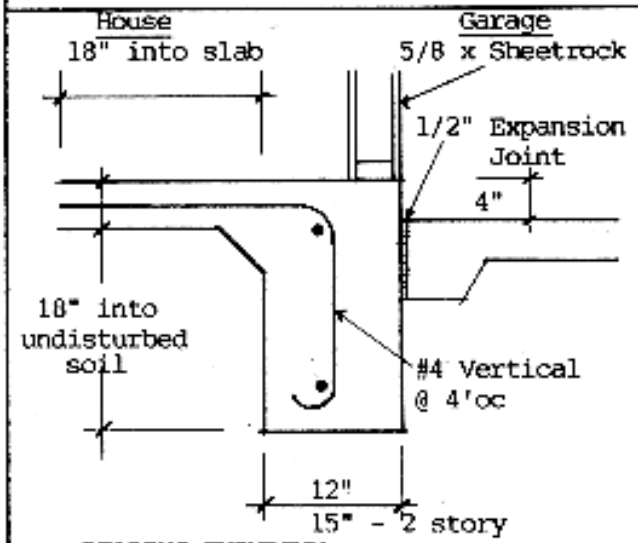




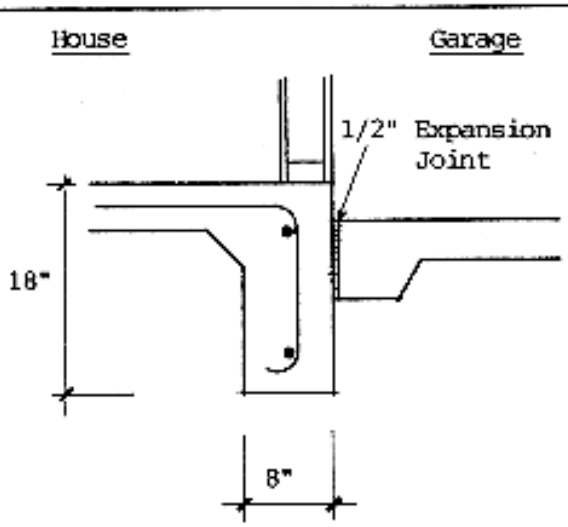
NOTE: Excavate 18" into undisturbed soil
Refill with ABC to 95% compaction
Engineered fill only
INTERIOR BEARING FOOTING



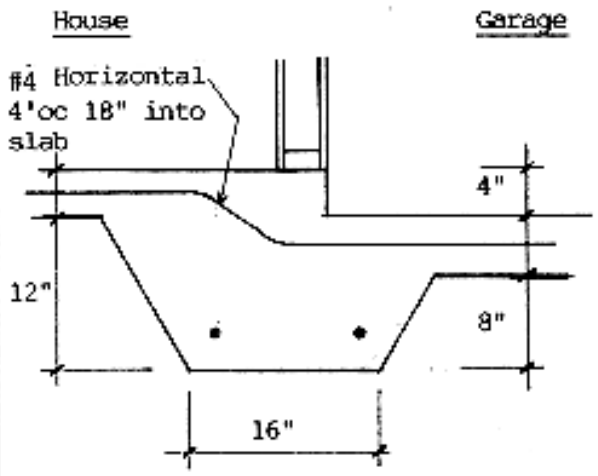
INTERIOR BEARING FOOTING



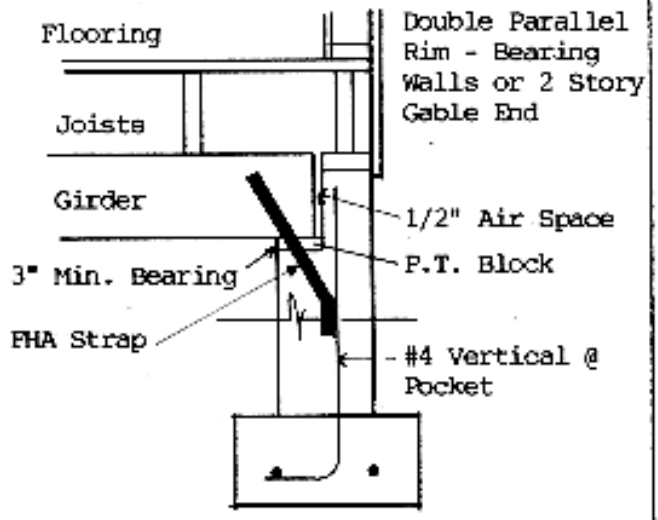
BEARING TURNDOWN



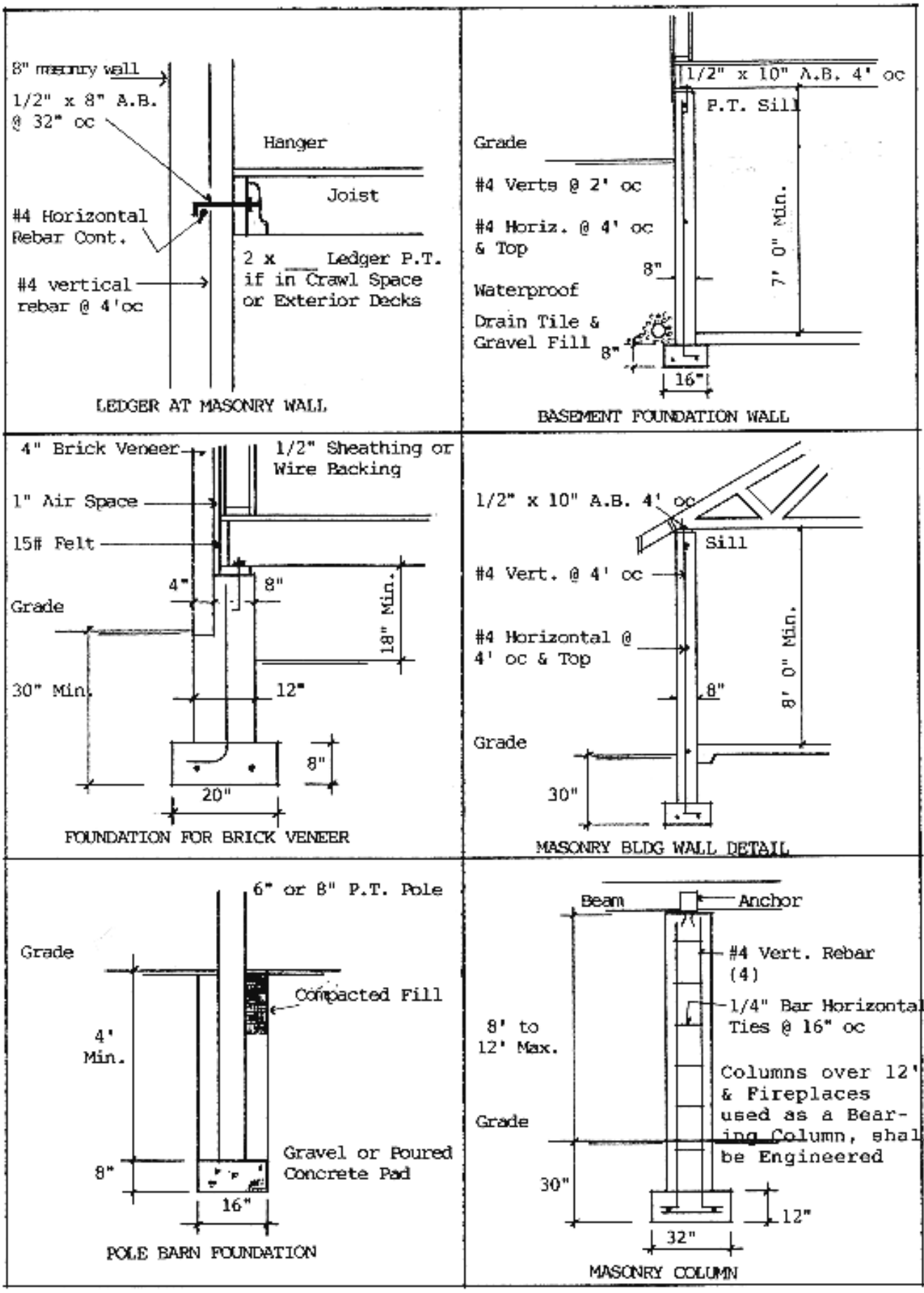
NON-BEARING TURNDOWN

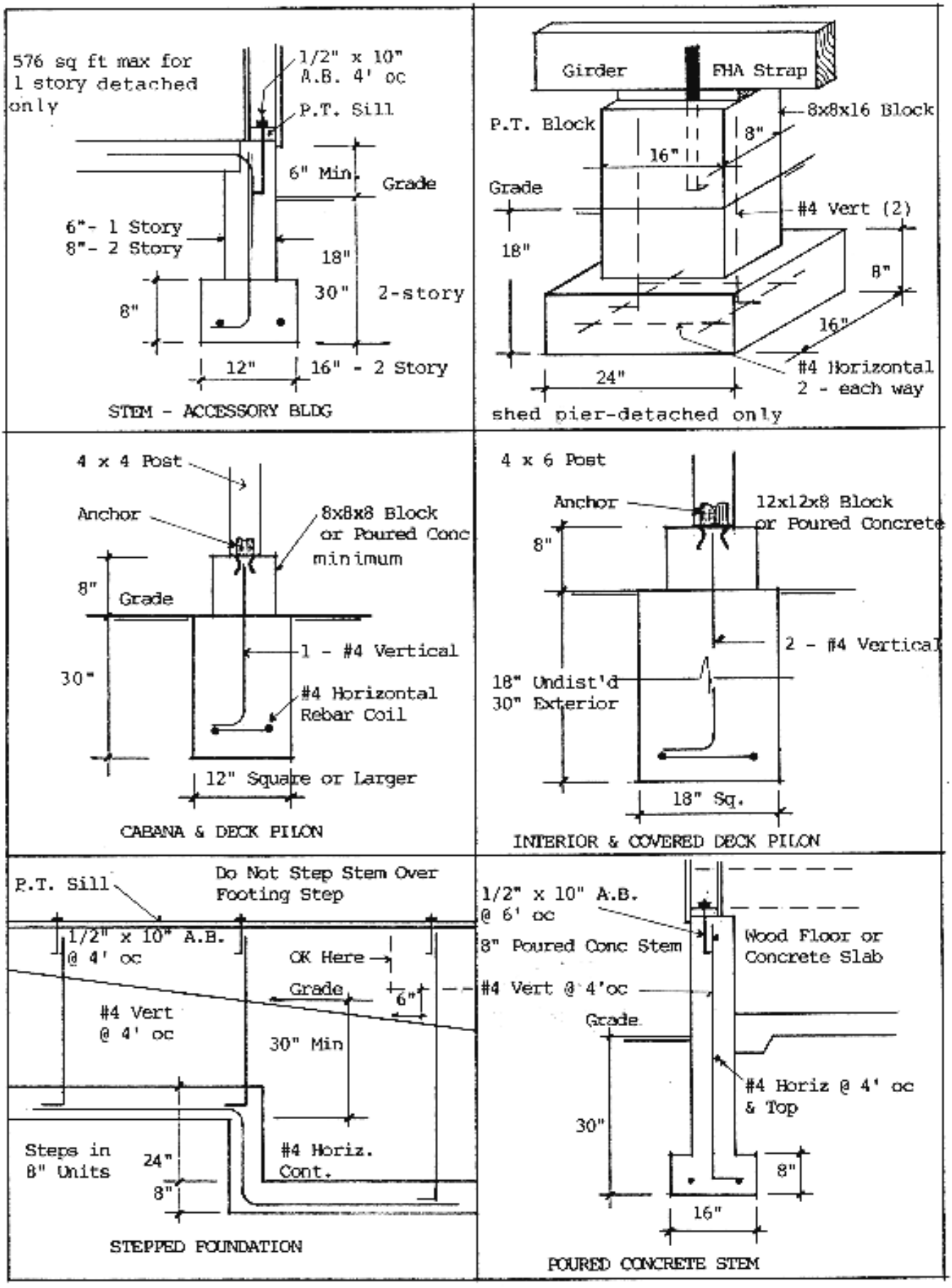


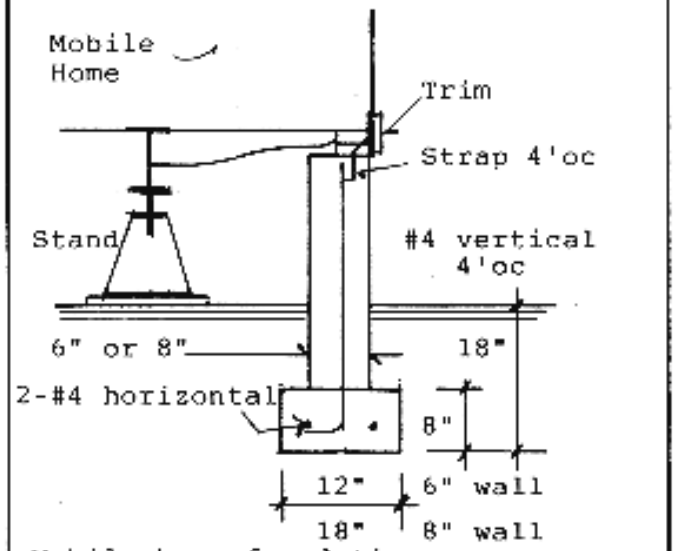
BEARING MONO-POUR
Engineered fill only



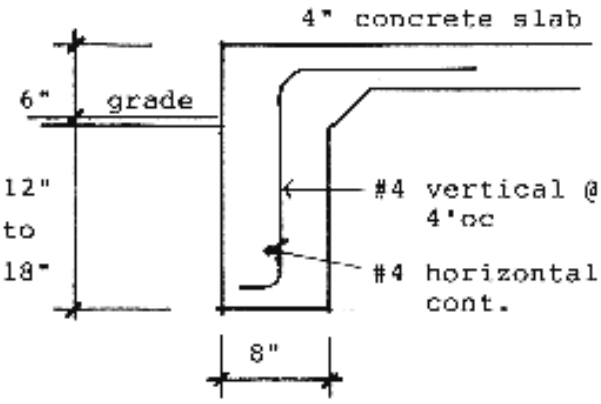
MASONRY GIRDER POCKET


8" masonry wall
1/2" x 8" A.B. @ 32" oc
Hanger
Joist
#4 Horizontal Rebar Cont.
2 x ___ Ledger P.T. if in Crawl Space or Exterior Decks
#4 vertical rebar @ 4'oc
LEDGER AT MASONRY WALL
1/2" x 10" A.B. 4' oc
P.T. Sill
Grade
#4 Verts @ 2' oc
#4 Horiz. @ 4' oc & Top
8"
7' 0" Min.
Waterproof
Drain Tile & Gravel Fill
8"
16"
BASEMENT FOUNDATION WALL
4" Brick Veneer
1/2" Sheathing or Wire Backing
1" Air Space
15# Felt
4"
8"
18" Min.
Grade
30" Min.
12"
8"
20"
FOUNDATION FOR BRICK VENEER
1/2" x 10" A.B. 4' oc
Sill
#4 Vert. @ 4' oc
#4 Horizontal @ 4' oc & Top
8"
8' 0" Min.
Grade
30"
MASONRY BLDG WALL DETAIL
6" or 8" P.T. Pole
Grade
Compacted Fill
4' Min.
8"
Gravel or Poured Concrete Pad
16"
POLE BARN FOUNDATION
Beam
Anchor
#4 Vert. Rebar (4)
1/4" Bar Horizontal Ties @ 16" oc
8' to 12' Max.
Columns over 12' & Fireplaces used as a Bearing Column, shall be Engineered
Grade
30"
12"
32"
MASONRY COLUMN

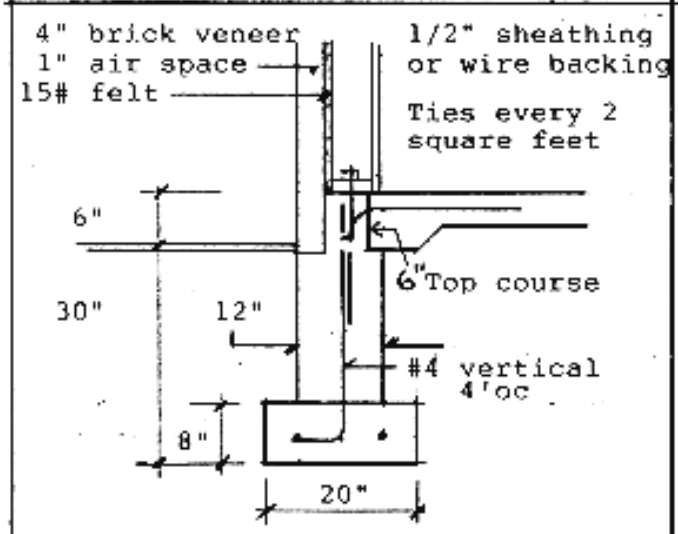

576 sq ft max for
1 story detached
only
1/2" x 10"
A.B. 4' oc
P.T. Sill
6" Min.
Grade
6"- 1 Story
8"- 2 Story
18"
30"
2-story
8"
12"
16" - 2 Story
STEM - ACCESSORY BLDG
Girder
FHA Strap
8x8x16 Block
P.T. Block
8"
16"
Grade
#4 Vert (2)
18"
8"
16"
24"
#4 Horizontal
2 - each way
shed pier-detached only
4 x 4 Post
Anchor
8x8x8 Block
or Poured Conc
minimum
8"
Grade
1 - #4 Vertical
30"
#4 Horizontal
Rebar Coil
12" Square or Larger
CABANA & DECK PILON
4 x 6 Post
Anchor
12x12x8 Block
or Poured Concrete
8"
2 - #4 Vertical
18" Undist'd
30" Exterior
18" Sq.
INTERIOR & COVERED DECK PILON
P.T. Sill
Do Not Step Stem Over
Footing Step
1/2" x 10" A.B.
@ 4' oc
OK Here
Grade
6"
#4 Vert
@ 4' oc
30" Min
Steps in
8" Units
24"
8"
#4 Horiz.
Cont.
STEPPED FOUNDATION
1/2" x 10" A.B.
@ 6' oc
8" Poured Conc Stem
Wood Floor or
Concrete Slab
#4 Vert @ 4'oc
Grade
#4 Horiz @ 4' oc
& Top
30"
8"
16"
POURED CONCRETE STEM



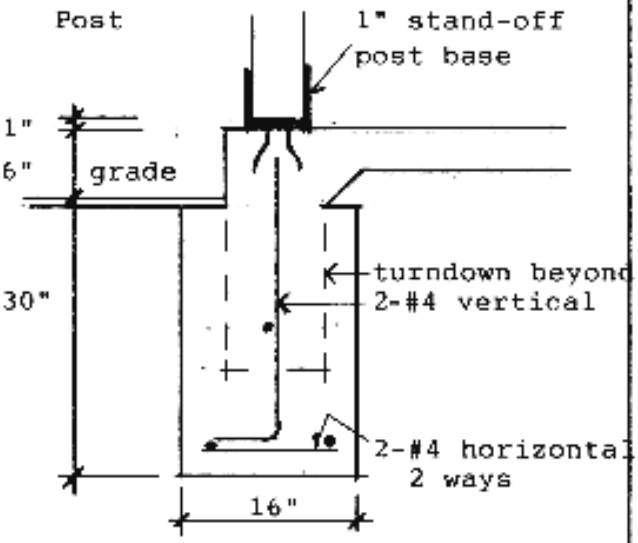
Mobile home foundation



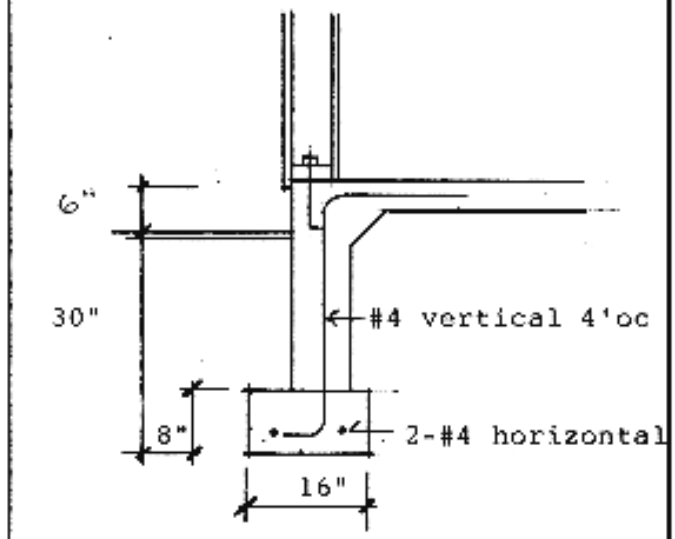
Non-bearing slab turndown



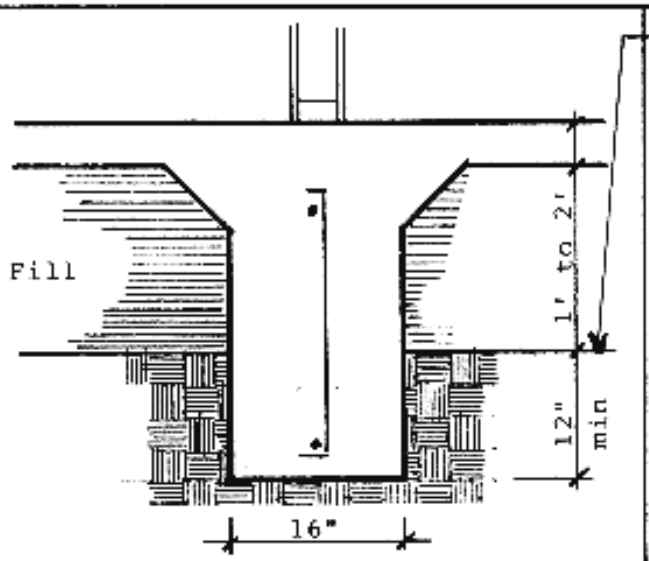
stem/slab for brick veneer



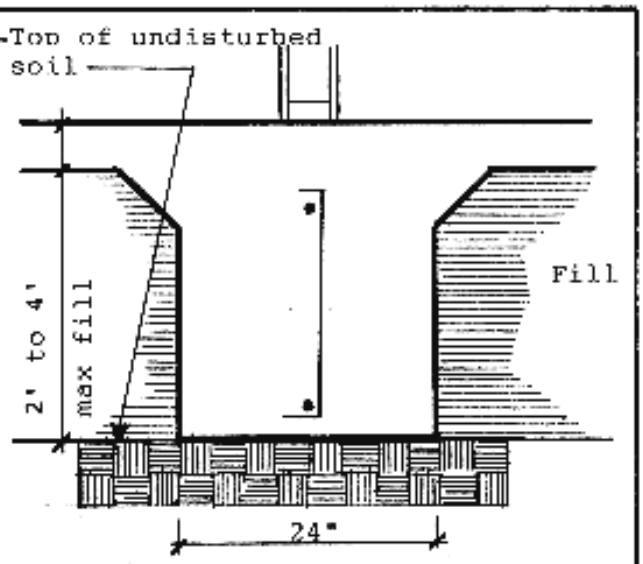
slab porch post footing



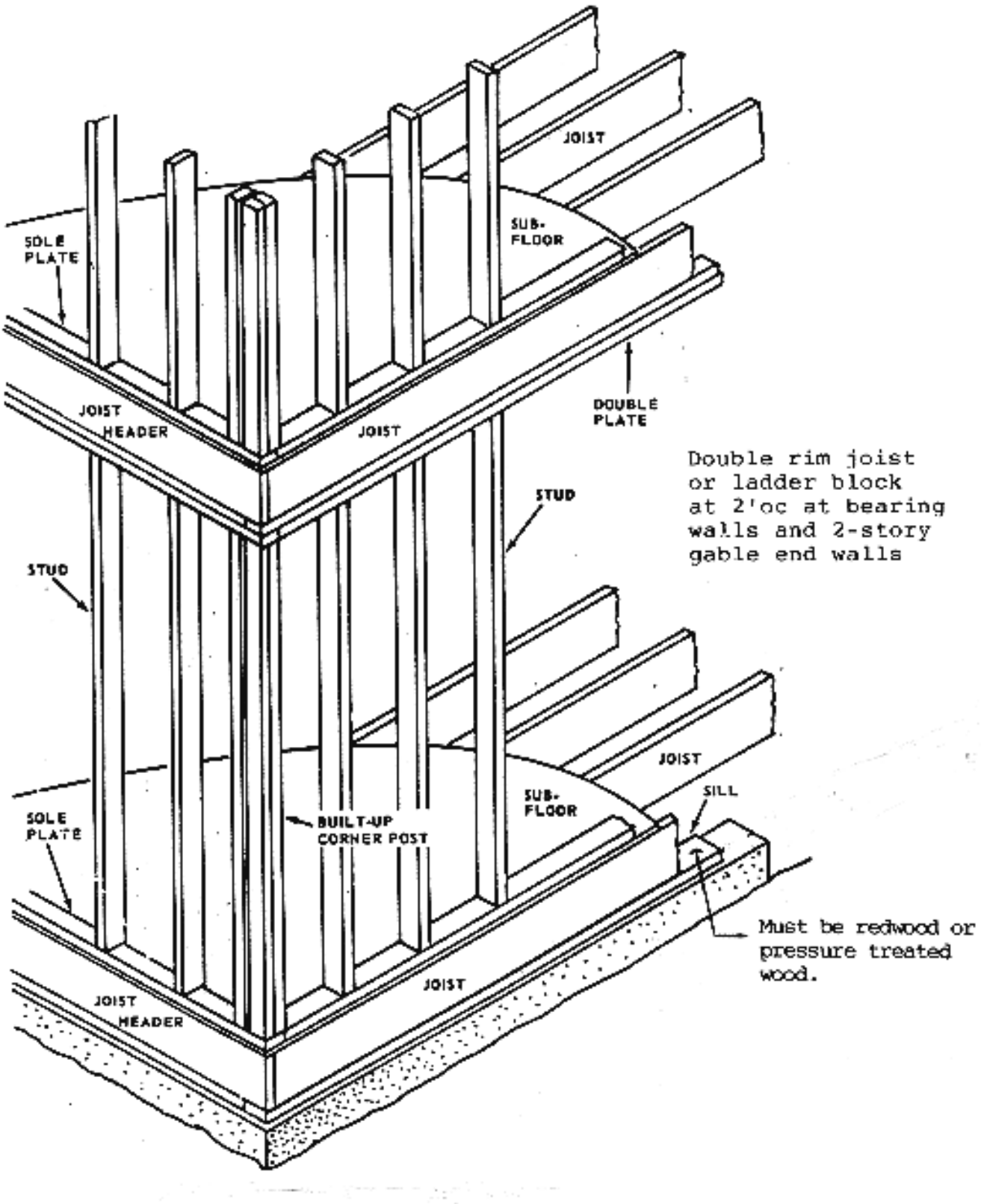
mono pour stem/slab on footing



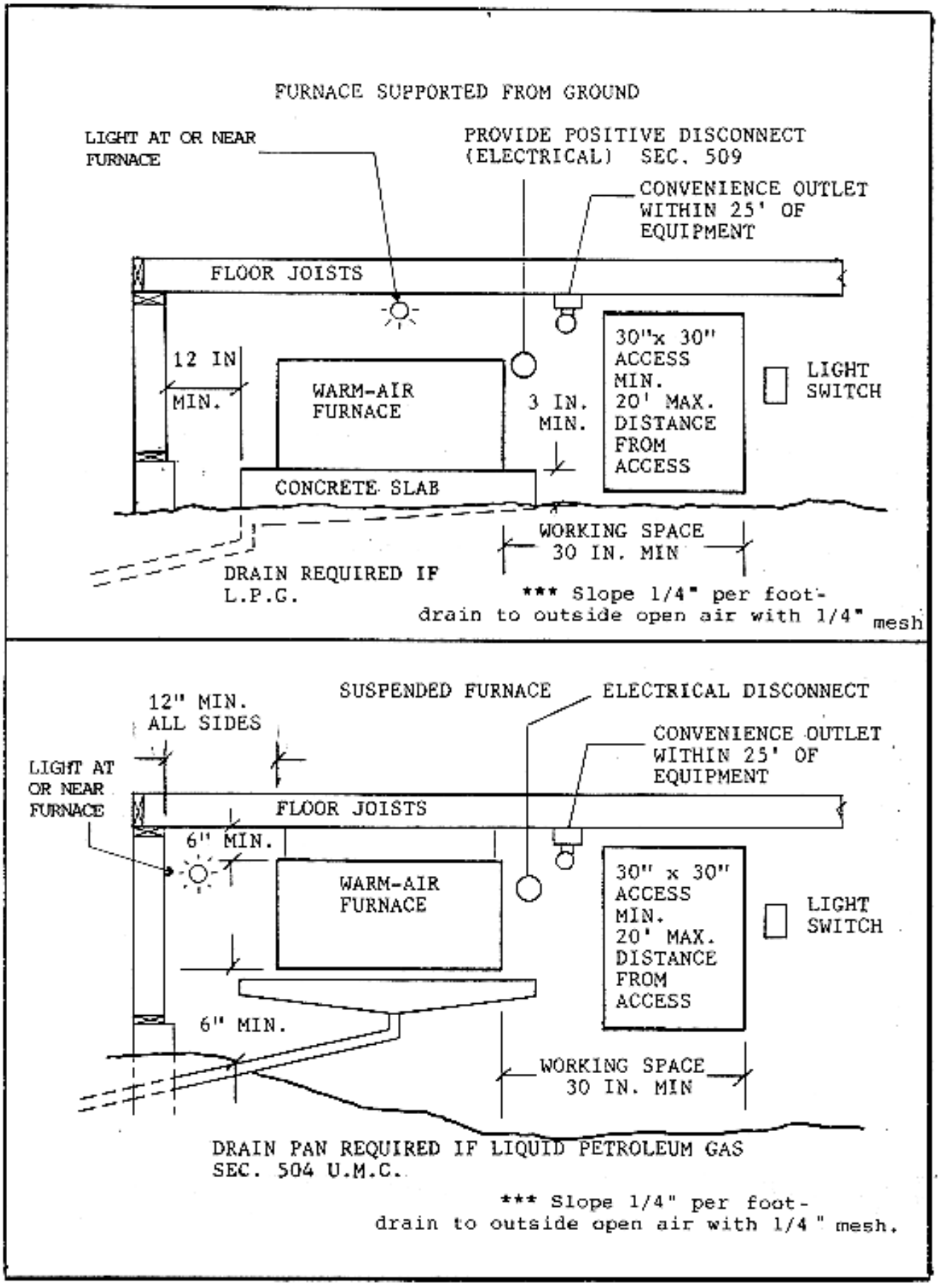
Grade Beam Thru Fill

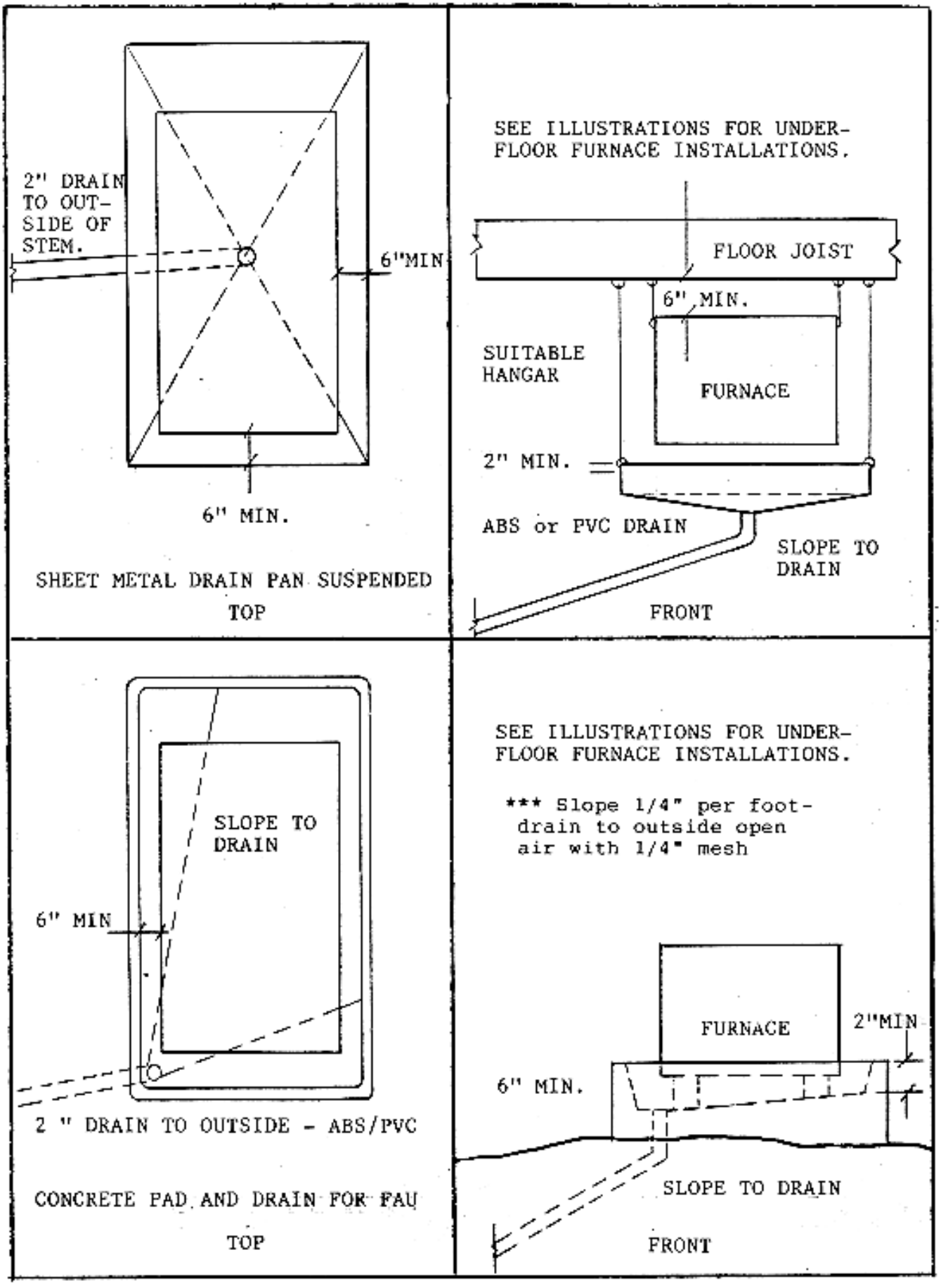


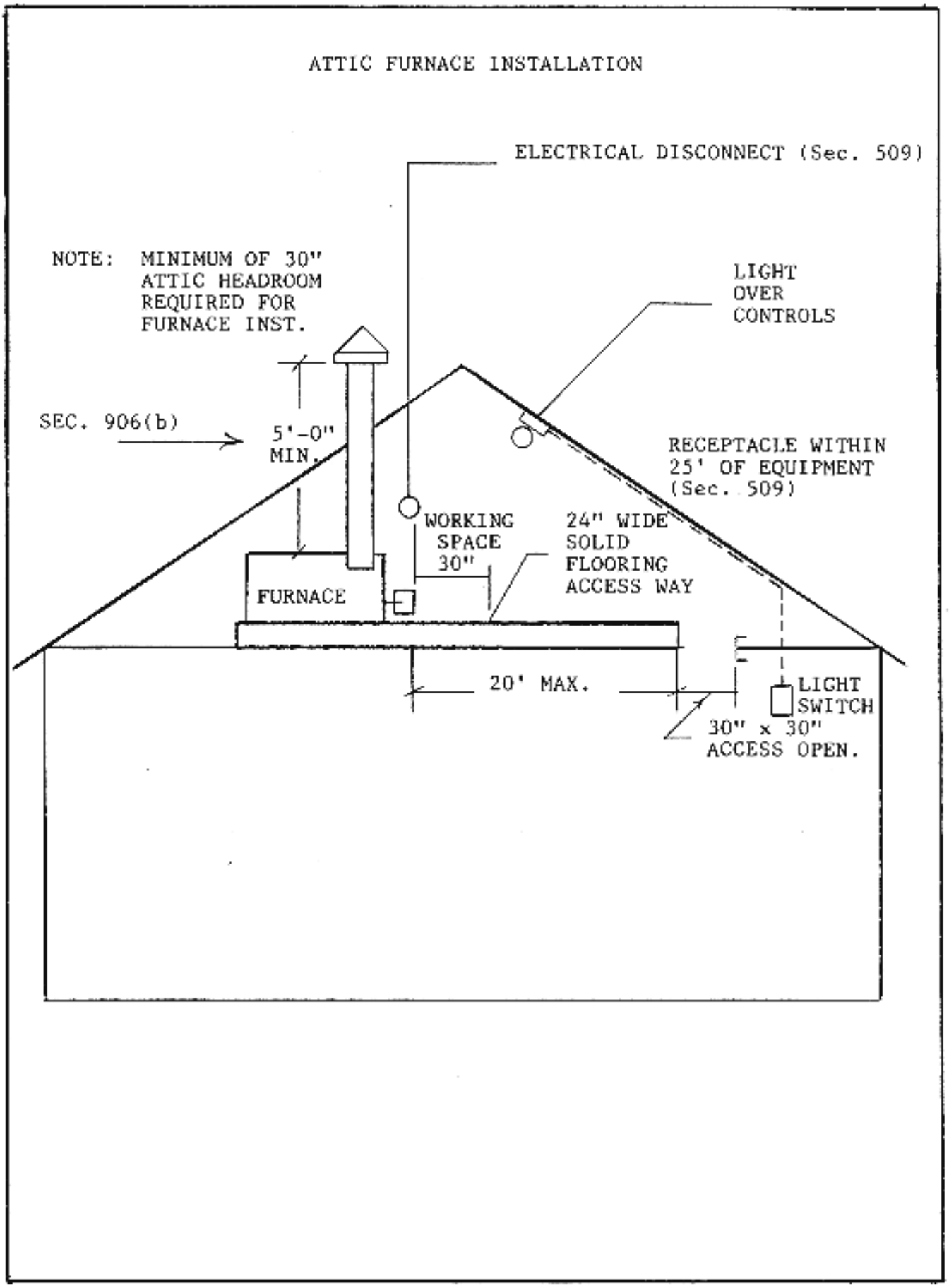
Grade Beam Thru Fill



PLATFORM FRAMING AT FIRST AND SECOND FLOOR LEVELS


FURNACE SUPPORTED FROM GROUND
LIGHT AT OR NEAR FURNACE
PROVIDE POSITIVE DISCONNECT (ELECTRICAL) SEC. 509
CONVENIENCE OUTLET WITHIN 25' OF EQUIPMENT
FLOOR JOISTS
12 IN MIN.
WARM-AIR FURNACE
3 IN. MIN.
30"x 30" ACCESS MIN. 20' MAX. DISTANCE FROM ACCESS
LIGHT SWITCH
CONCRETE SLAB
WORKING SPACE 30 IN. MIN
DRAIN REQUIRED IF L.P.G.
*** Slope 1/4" per foot- drain to outside open air with 1/4" mesh
SUSPENDED FURNACE
ELECTRICAL DISCONNECT
12" MIN. ALL SIDES
LIGHT AT OR NEAR FURNACE
CONVENIENCE OUTLET WITHIN 25' OF EQUIPMENT
FLOOR JOISTS
6" MIN.
WARM-AIR FURNACE
30" x 30" ACCESS MIN. 20' MAX. DISTANCE FROM ACCESS
LIGHT SWITCH
6" MIN.
WORKING SPACE 30 IN. MIN
DRAIN PAN REQUIRED IF LIQUID PETROLEUM GAS SEC. 504 U.M.C.
*** Slope 1/4" per foot- drain to outside open air with 1/4" mesh.


2" DRAIN TO OUT-SIDE OF STEM.
6"MIN
6" MIN.
SHEET METAL DRAIN PAN SUSPENDED
TOP
SEE ILLUSTRATIONS FOR UNDER-FLOOR FURNACE INSTALLATIONS.
FLOOR JOIST
6" MIN.
SUITABLE HANGAR
FURNACE
2" MIN.
ABS or PVC DRAIN
SLOPE TO DRAIN
FRONT
SLOPE TO DRAIN
6" MIN
2 " DRAIN TO OUTSIDE - ABS/PVC
CONCRETE PAD AND DRAIN FOR FAU
TOP
SEE ILLUSTRATIONS FOR UNDER-FLOOR FURNACE INSTALLATIONS.
*** Slope 1/4" per foot-drain to outside open air with 1/4" mesh
FURNACE
2"MIN
6" MIN.
SLOPE TO DRAIN
FRONT


ATTIC FURNACE INSTALLATION
ELECTRICAL DISCONNECT (Sec. 509)
NOTE: MINIMUM OF 30" ATTIC HEADROOM REQUIRED FOR FURNACE INST.
LIGHT OVER CONTROLS
SEC. 906(b)
5'-0" MIN.
RECEPTACLE WITHIN 25' OF EQUIPMENT (Sec. 509)
WORKING SPACE 30"
24" WIDE SOLID FLOORING ACCESS WAY
FURNACE
20' MAX.
LIGHT SWITCH
30" x 30" ACCESS OPEN.